

# FLIGHT

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AND AIRSHIPS

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## CONTENTS

	PAGE
Editorial Comment:	
Re-equipment ..	339
The Stieger ST.4 ..	341
Pobjoy "R" Engine ..	349
Municipal Aerodromes ..	351
Aerodromes: By John Dower ..	356
Airport News ..	361
Air Transport ..	362
Private Flying and Gliding ..	363
Airisms from the Four Winds ..	364
Royal Air Force ..	365
Imports and Exports ..	366

## EDITORIAL COMMENT



On other pages will be found notices dealing with the progress of equipment in the Royal Air Force and also in Imperial Airways. To those interested in the progress of flying there are few things more gratifying than a study of notices of re-equipment in the two classes of civil and Service aircraft. When a firm produces a new type, the aeronautical student is filled with speculation. The designing firm is certain that nothing better of its class has ever been produced. It is Re-equipment fairly certain that the new type is superior in several respects to the type in use at the moment. The existing type has done good service in its day. When it was new it was probably hailed as the very last word, and the squadron or company or club which used it was filled with delight at its excellences. Time passes, and gradually it comes to be felt that something better might be found. Certain problems are presented to the designer. Can he increase the performance of the machine without sacrificing some other desirable quality? He has made the attempt, and proudly presents his latest model. But what will Martlesham think of it? Other firms have also entered for the competition, and each is convinced that its own product is the best solution of the problems set. The competition which follows is as exciting in its way as the Derby or the Cup Tie final.

Then rumours go round that the Air Ministry or a civil firm has adopted a certain one of the competing types, but, in the case of Service machines, nothing is certain until the re-equipment programme is published. Then we know for certain which type has been judged best, which squadron is to get it, and the approximate dates at which delivery will commence and finish. Faith and hope, as the hymn has it, vanish into sight and delight. The successful firm receives congratulations and emoluments. The lucky squadron becomes an object of interest and envy to all the other units in the same Area. John Citizen, so far as he is aware of what has happened, sleeps sounder o' nights. The firms who have

## DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1932

- Apr. 23. No. 45 Sqdn. R.A.F. Reunion Dinner at Crown and Cushion Restaurant, London Wall.
- Apr. 23. Brooklands Ae.C. Dance.
- Apr. 23-30. National Aviation Day Displays. (See p. 366.)
- Apr. 26. Aero Golfing Society: Instone Challenge Cup, Berkshire G.C.
- Apr. 29. Cinque Ports F.C. Dance.
- May 1. Northamptonshire Ae.C. Combined Motor-cycling and Flying Display.
- May 1. Entries close at double fees for King's Cup Race.
- May 7. Heston Spring Cruise begins.
- May 7. Antwerp Aviation Club Air Display and Garden Party.
- May 14. Coventry Ae.C. Air Pageant.
- May 14-15. Skegness Air Pageant.
- May 16. Northamptonshire Ae.C. Annual Pageant.
- May 18. Household Brigade Flying Club Meeting, Heston.
- May 21. "Morning Post" Cross-Country Air Race, Heston.
- May 21-23. Scottish Flying Club Display, Moorpark, Renfrew.
- May 22-30. Conference of Transoceanic Aviators at Rome.
- May 25. Opening of Royal Tournament, Olympia.
- May 28. London-Newcastle Air Race for "Newcastle Evening World" Trophy.
- May 27-28. Brooklands Meeting.
- June 4. Bristol Airport Summer Flying Meeting.
- June 4. Cardiff Flying Meeting.
- June 4. Leicester Ae.C. Flying Display and Motor Gymkhana at Ratcliffe Aerodrome.
- June 5. Reading Ae.C. At Home, Woodley Aerodrome.
- June 11. Leicester Ae.C. Meeting, Desford.
- June 11. Close of Royal Tournament, Olympia.
- June 12. Herts and Essex Ae.C. Meeting at Broxbourne.
- June 18. Hull Air Display.
- June 21. Aero Golfing Society: "Flight" Challenge Cup, Bramshott G.C.
- June 21-28. Blackpool Air Pageant, Stanley Park.
- June 25. R.A.F. Display, Hendon.
- June 25-26. International Tourist Rally, Boulogne.
- July 2. Opening of Portsmouth Municipal Aerodrome.
- July 2-3. International Tourist Rally, Rheims.
- July 3. Husbands Bosworth Flying Meeting.
- July 8-9. King's Cup Air Race, start and finish Brooklands.
- Nov. 25-Dec. 11. Paris Aero Show.

not been successful determine to try again and do better next time.

The last quarter has seen some very good work done in the issue of complete outfits of "Fury" interceptors to No. 1 (Fighter) Squadron at Tangmere and to No. 25 (Fighter) Squadron at Hawkinge. A while ago there was some consideration as to which of these two squadrons should have priority in getting the "Fury." First No. 25 F.S. was selected, and then a change was made to No. 1 F.S. In the result both squadrons have received the "Fury" in the first quarter of this year. Now all the three squadrons on the two coast aerodromes of Hawkinge and Tangmere are equipped with interceptor fighters. We have already expressed some doubts as to whether the coast is the proper place to station interceptor squadrons. The experiences of the last Air Exercises went to show that they would have a better chance of intercepting if stationed at aerodromes farther inland, such as Biggin Hill and North Weald; while "Bulldogs" would seem suitable for waiting on the coast to catch raiders on their return journey. We suppose that further experiments are to be made in future exercises with interceptors on the coast, and certainly, now that three interceptor squadrons are available, the tests are likely to be much more thorough and convincing. We are perfectly ready to change our opinion if experience shows that interceptors can do their work most efficiently from the coast; and we feel sure that the authorities of A.D.G.B. are equally ready to change theirs if the reverse is proved to be the case.

In the same quarter the Ulster Cadre Bomber Squadron, No. 502, has exchanged the "Hyderabad" for the "Virginia." Both types must be regarded as obsolescent, and it is just a trifle strange that it should have been thought worth while to make the change at this stage. The "Hyderabad" has disappeared completely from the equipment of regular squadrons, whereas the "Virginia" is still standard equipment of a number of night-bombing squadrons, pending the production and adoption of a new night-bomber. Of the two, the "Virginia" carries a good load of bombs, but is slow, while the "Hyderabad" is somewhat faster but only carries a comparatively light load of bombs. From the point of view of defence, it appears to us reasonable that, while the Auxiliary squadrons need not receive quite the latest equipment, the Cadre squadrons, each of which has one complete regular flight, should be as well equipped as are the regulars. Perhaps that is why the Ulster squadron has been given the "Virginia" for the time being. We hope that both it and the regular night-bombing units will soon receive something of modern and up-to-date design.

The coming quarter is to witness one very interesting case of re-equipment. No. 100 (Torpedo-Bomber) Squadron, stationed at Donibristle, on the Firth of Forth, is still equipped with the time-honoured "Horsley." In the present quarter it is due to exchange this for the Vickers "Vildebeeste," with a Bristol Pegasus engine, as its new torpedo-plane. In a recent issue we gave some account of the "Vildebeeste" with a 595-h.p. Hispano-Suiza engine. When the new service type is transferred from the Part Publication to the Open List, it will be interesting to compare the performances of the two versions of this machine. For many years past,

the name of Vickers has been associated in the Royal Air Force with large twin-engined machines, and this adoption of a single-engined machine is distinctly interesting.

There is also an interesting innovation to be noted in the Fleet Air Arm. No. 404 (Fleet Fighter) Flight is being renumbered No. 420 and becomes a Fighter Reconnaissance Flight, with the "Osprey" as its standard equipment. Hitherto there has been no class of Fighter Reconnaissance Flights in existence, and also there have been no numbers starting with 420. Flights numbered from 400 to 409 have been Fleet Fighters, those from 440 to 450 Fleet Spotter Reconnaissance, and from 460 onwards Fleet Torpedo Bomber Flights. The introduction of the "Osprey" accounts for the starting of a new class of flight. Another Fleet Fighter Flight, No. 402, receives the single-seater "Nimrod" in place of the "Flycatcher," with which all Fleet Fighter Flights have been equipped since some date not very subsequent to the voyage of Noah. The Fairey firm can be congratulated on the long run and great popularity of the "Flycatcher," but all good things must come to an end.

Once again we have to assert that during the present quarter the last "Bristol Fighters" as squadron equipment will disappear from the Air Force List. No. 6 (Bomber) Squadron at Ismailia has performed the functions of a museum for too long; but some of its "Gordons" have been already delivered, and the rest are due this quarter. We understand that over 60 "Gordons" have been ordered, and three other bomber squadrons, Nos. 14, 35 and 207, the first of which is at Amman and the other two at Bircham Newton, all of which are now flying Fairey III F's, are to receive "Gordons" in the present quarter. Another Army co-operation squadron in England, No. 13, at Netheravon, is getting the Hawker "Audax" with Kestrel engine in place of the "Atlas." The "Audax" is the Army co-operation version of the "Hart." Its speed and range will enable it to carry out medium reconnaissance, and to bomb the back areas of the enemy's army; while at the same time it will be a formidable nut for hostile fighters to crack.

Imperial Airways have issued some details about the Armstrong-Whitworth "Atalanta" class of passenger machine which they hope to put in service on the Africa airway before the end of the year. Its four Double Mongoose 350-h.p. engines should enable it to rise with ease off the aerodromes of Africa, which are sometimes at an altitude of 5,000 feet. It will fly on three engines at a height of 9,000 feet. Its cruising speed of 120 m.p.h. should enable it to reduce the journey from 11 to 9 days. But it weighs nearly 8 tons when fully loaded, and in the rainy season the aerodromes in the Sudan (with the one exception of Juba) will hardly, we understand, bear this weight. Sir Vyell Vyvyan stated when he was in South Africa after making the first mail flight there, that until aerodromes which could be used all the year round can be found, flying boats will probably continue to be used between Khartum and Kisumu. No passenger needs condolence for having to fly in a "Calcutta." In any case the production of the "Atalanta" marks a further step in the progressive advance of Imperial Airways.



# The Stieger ST. 4

*Built by General Aircraft, Limited, of Croydon, and incorporating the Monospar System of Construction invented by Mr. H. J. Stieger, this machine is a four-seater fitted with two Pobjoy "R" Engines. That the Stieger System does give low structure weight appears to be proved by the fact that the ratio of gross weight to tare weight of the ST. 4 reaches the high value of 1.84 so that the machine carries as normal disposable load 84 per cent. of its own weight*

**I**N presenting to our readers an illustrated description of the Stieger ST.4 monoplane this week, we are faced with a slight difficulty arising out of the fact that, at the moment of writing, the machine is not entirely finished. In consequence it is not possible, for one thing, to publish photographs of the machine in its completed form, and, secondly, actual performance figures, etc., are not available. However, as the machine is certainly an unusually interesting one, both from the designer's and from the user's point of view, we have thought that the best procedure would be to deal with the ST.4 this week mainly from the structural aspect, leaving the subject of the practical or operational features for a subsequent article. In order, however, to give our readers a slightly better idea of how the ST.4 will appear when finished, we have had blocks made of some photographs of a scale model, and these will be found in the description which follows.

Before turning our attention to the structural details of the ST.4 it may be of assistance to our readers if we mention quite briefly that the machine is designed as a four-seater twin-engined monoplane, ability to maintain height with one engine out of action having been kept prominently in view during design. By clean aerodynamic design, low structure weight, and light engines, it is thought that this desirable quality has been attained, although definite proof in the form of actual test flights must still be awaited. A cruising speed of approximately 115 m.p.h. (185 km./h.) has been aimed at.

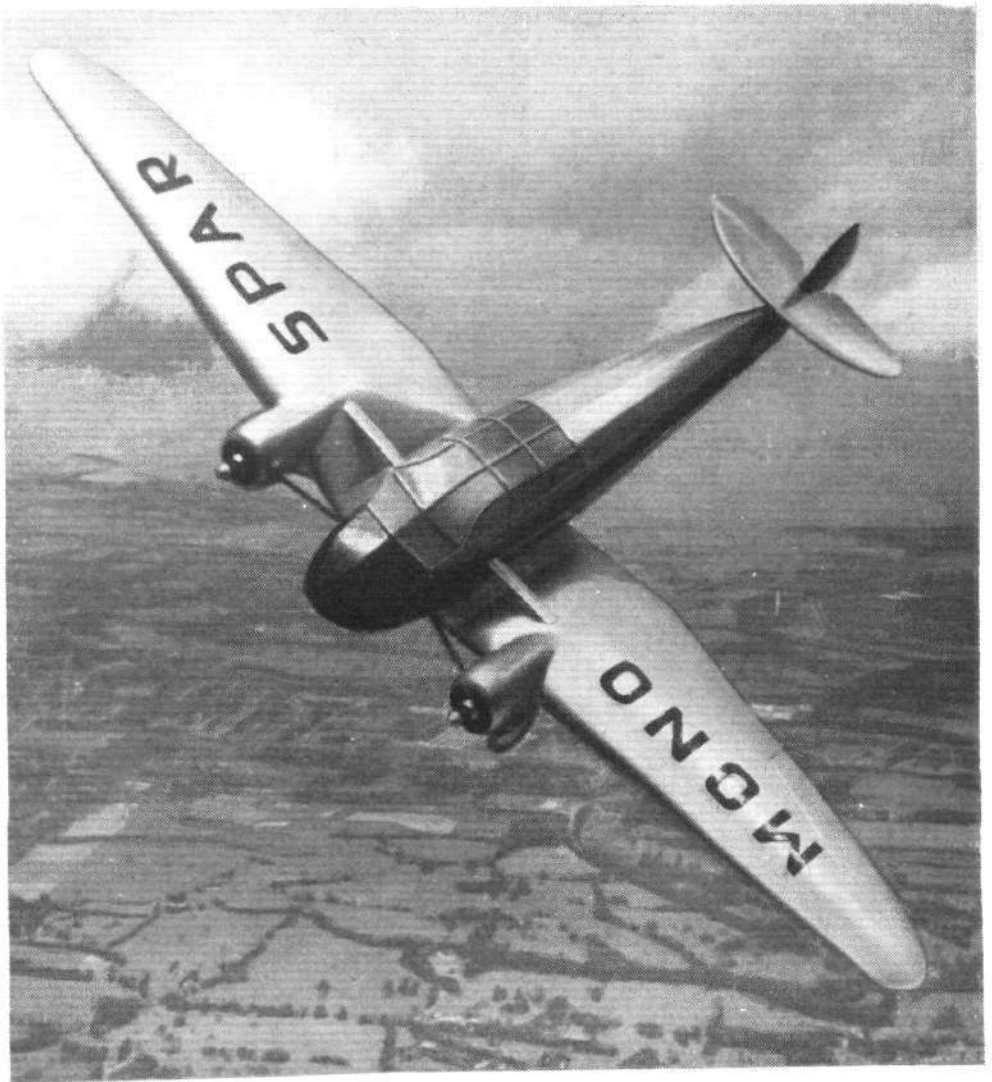
## Structural Design

In the design of the machine to be marketed shortly by General Aircraft, Ltd., of Croydon, Mr. Stieger has applied his monospar principle of construction not only to the wing, but also, to some extent, to the fuselage. Perhaps some of our readers may remember that something of the sort was done in the case of the first experimental machine designed by Mr. Stieger and the Mono-spar Company, and built by the Gloster Aircraft Co., Ltd., at Brockworth. That machine (see FLIGHT of July 10, 1931) was purely experimental, and the details, although somewhat similar in general principle, differed very materially from the present type. Both wing and fuselage were of monospar construction, but the wing spar as well as the fuselage girder employed a different formation of the structure. The spar, it may be recollected, had a single flat duralumin web, with triangular holes stamped out for lightness, while the booms were built up to form a tube of somewhat irregular contour. The fuselage girder was of square cross section, and consisted of four "D"-section booms held apart by tubular struts, and braced by duralumin sheet stamped out to form a

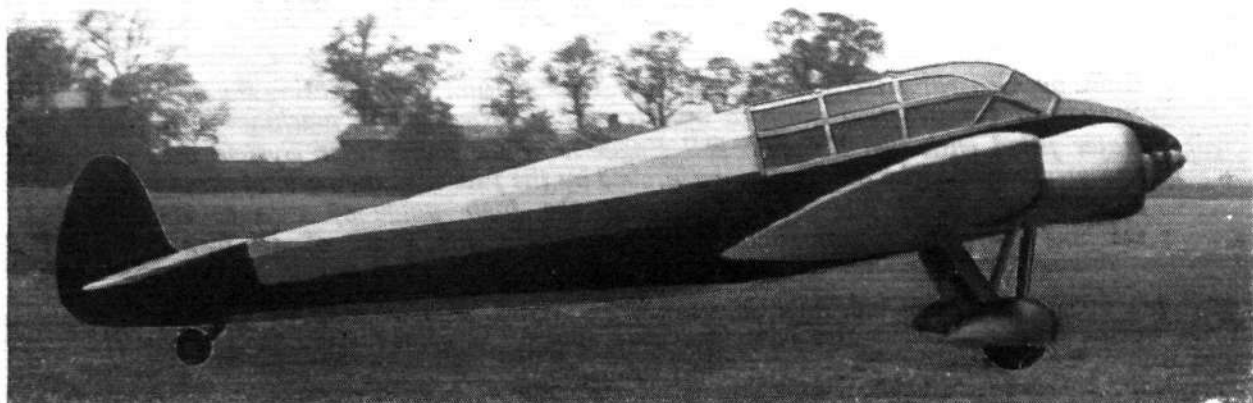
series of Warren girder ties around the periphery of the girder. In point of fact, the fuselage girder of the earlier machine approached less to the monospar principle than does that of the new machine, the pyramid bracing being compressed into the cross-sectional area of the girder, while in the new type the struts and diagonal tie rods of the monospar wing system are repeated in the fuselage structure (rear portion). In fact, the fuselage structure of the first machine resembled more nearly the Breguet type of construction, with a box section single spar in the bottom of the fuselage.

To anyone who had an opportunity of examining closely the details of the first small experimental machine designed by Mr. Stieger, the far greater simplicity of the ST.4 is apparent instantly. Not only the fuselage, but the wing structure is much simpler, and must have been far less costly to build. This, of course, is the usual and natural process of development of all types of aircraft, but is, perhaps, slightly more obvious in the new ST.4.

The ST.4 is a twin-engined low-wing monoplane of the full cantilever type. Great care has been taken to keep the aerodynamic design "clean," and in order to avoid too great interference between fuselage and wing roots, the



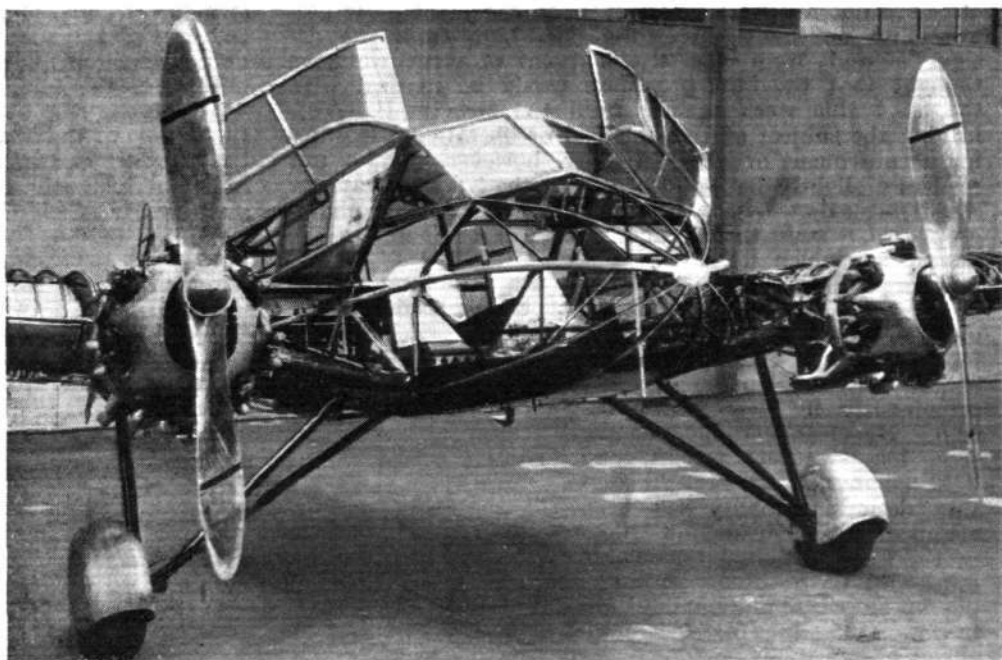
**AS IT WILL APPEAR :** A composite photograph of a scale model of the ST.4. The actual cowling over the Pobjoy engines will not be of the totally-enclosing type. (FLIGHT Photo.)



latter have been brought down to a thin section, while simultaneously the trailing edge near the body has been raised. Structurally, this arrangement has been achieved by continuing the top boom of the wing spar right across the fuselage, while the upper wing surface has been gradually reduced in camber as the fuselage is approached. As this surface drops away from the top spar boom, the latter becomes exposed, and is faired over the portion which extends from the surface of the wing to the side of the fuselage.

The wing consists structurally of three portions, or rather of two portions and a variation of one of them. These are: the wing root, the middle portion, and the wing tip. The middle portion and the tip are of dissimilar construction, although they are permanently attached together, while the wing root, permanently attached to the fuselage, and, indeed, forming an integral part of it, shows a type of construction quite different from both the middle and the end portions of the wing. The wing root extends outward to just beyond the engine mounting, and here occurs the hinge around which the wing pivots when folded.

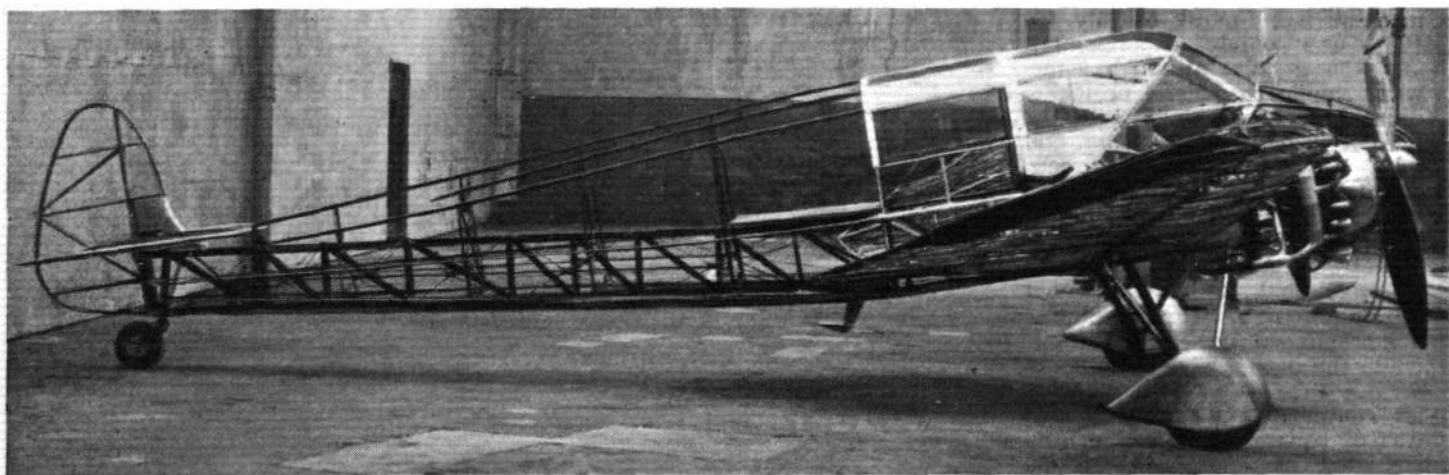
As the middle wing portion is really that which is typical of the wing construction, we will examine it first. The single spar comprises top and bottom flanges or booms. These flanges are of very simple construction, and consist of "square" section tubes with the corners rounded off, each tube being made in two halves riveted together,



**THE BUSINESS PORTION OF THE ST.4:** The Pobjoy "R" engines drive Fairey metal airscrews. Note the slimness of the Dowty telescopic legs. The cabin is reached via hinged combined doors and roof. (FLIGHT Photo.)

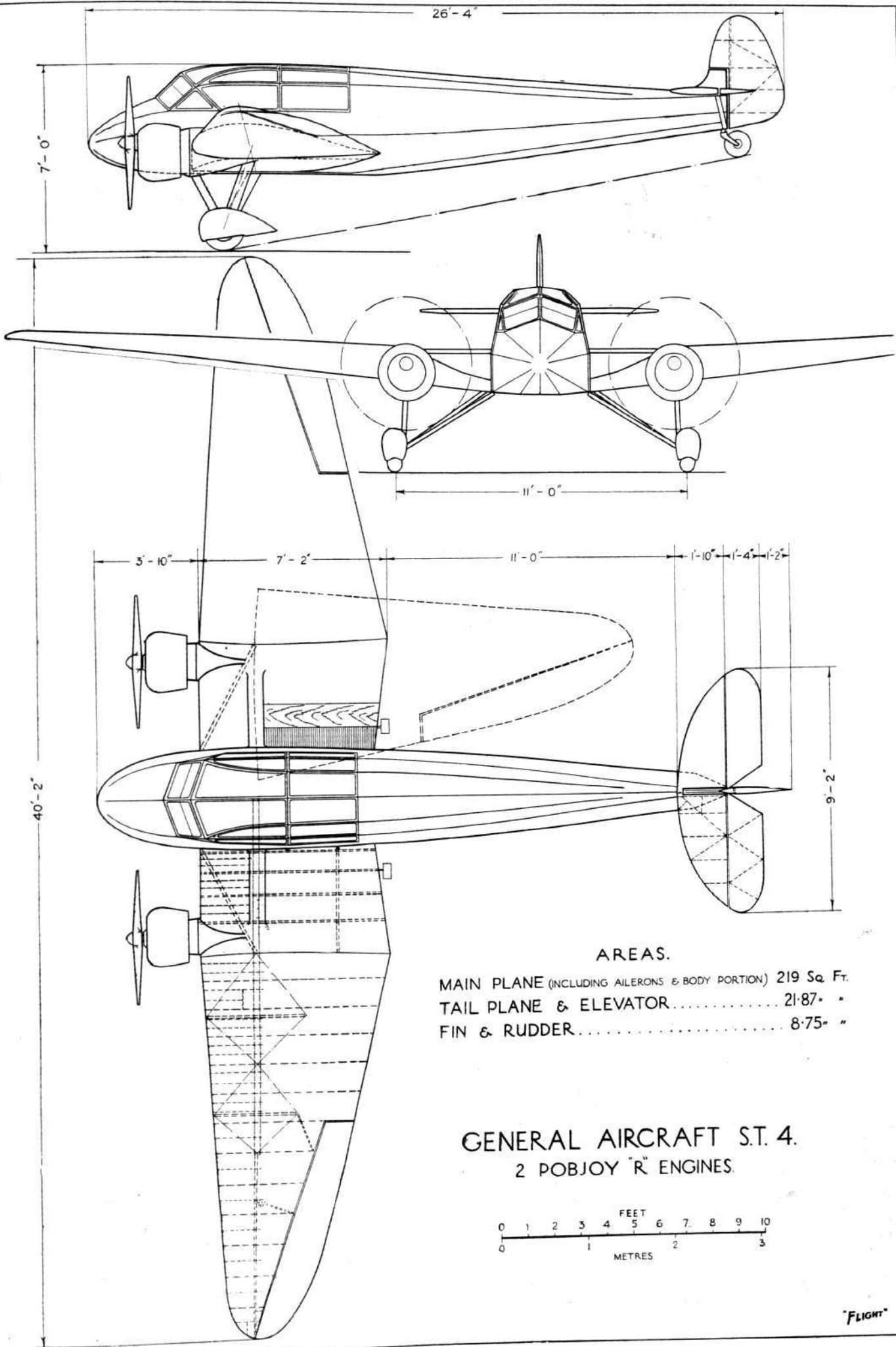
the riveting flanges being turned outward to make the rivets easily accessible, and placed on the centre line of the boom.

Instead of the single flat sheet web of the spar of the first machine, the shear members of the new spar are built-up square boxes arranged in a formation halfway between an N-girder and a Warren girder, the ties having a pronounced slope and the struts being not quite vertical, but less sloped than the ties, except for the two which occur

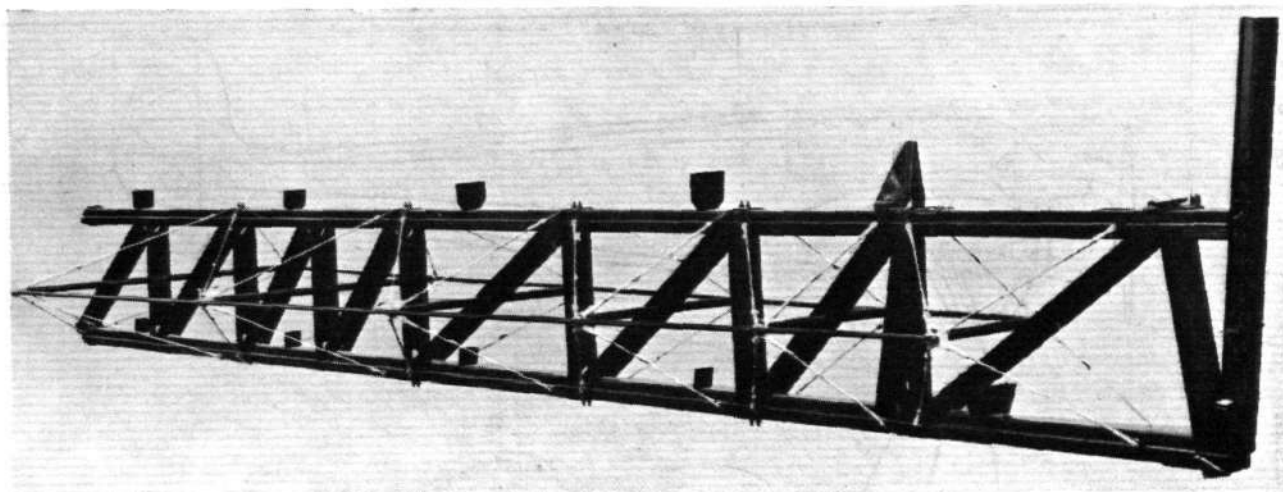


**SIDE VIEW OF THE ST.4:** The single girder of the fuselage primary structure can be clearly seen. Note also swivelling tail wheel. A corresponding view of the scale model is at the top of the page. (FLIGHT Photos.)





THE ST.4 : General Arrangement Drawings, to Scale.

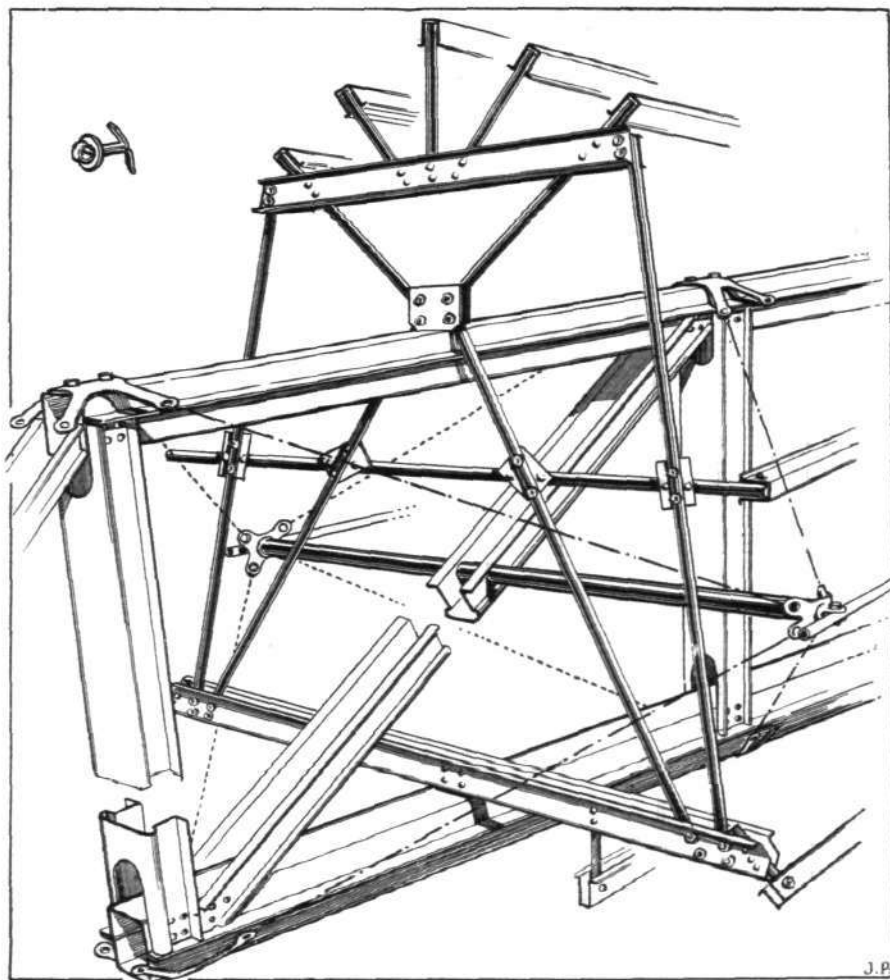


where the torsion bracing is attached to the booms. These two struts are vertical in order to take the compression loads caused by the converging top and bottom tie rods of the torsion bracing. The shear members in this portion of the wing are all of the same type of construction: a rectangular box section formed by side members of channel section, turned "back to back," and top and bottom members of flat duralumin sheet, riveted to the flanges of the channel sections.

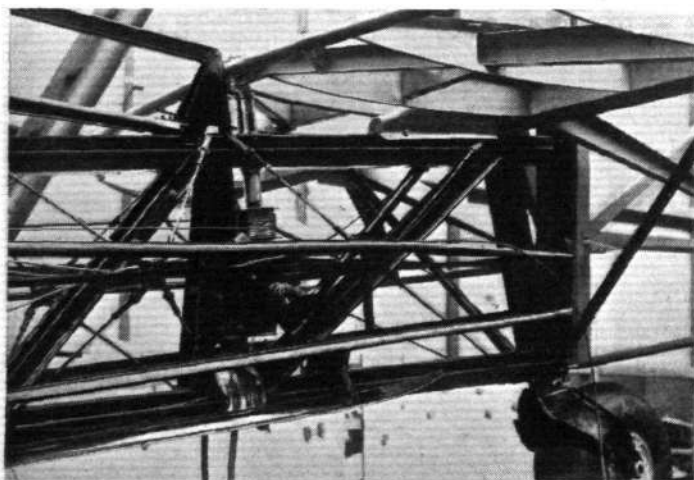
The pyramid bracing, which extends in its plain form over this portion of the wing only, consists of tubes parallel with the wing chord, and diagonal bracing in the form of tie rods attached alternatively to the spar booms and pyramid strut ends. The fittings on the spar booms and strut ends are of Habersohn's steel, and are in the form of plain four-armed "X's," except for the outer ones, which are the standard fittings with two of the arms cut off.

The tubes of the pyramid bracing are lightly secured at their centres to spar shear members by flat duralumin plates. The tube is a sliding fit in the plates, which only serve to stabilise the tube by halving its free length. Actually, from other structural considerations it is not, surprising as this may seem, necessary to secure the tube to the spar at all.

There are two ways of arranging the drag and anti-drag bracing in the monospar system of construction: either by wires joining the front and rear ends of the pyramid struts, in a direction parallel with the spar, or by making the leading edge of the wing the drag member. If this member is able to resist compression, obviously



**THE FUSELAGE GIRDER :** The photograph should be examined in conjunction with the sketches on the next page. Above sketch shows the details of the girder and the torsion bracing, etc. (FLIGHT Photo and Sketch.)

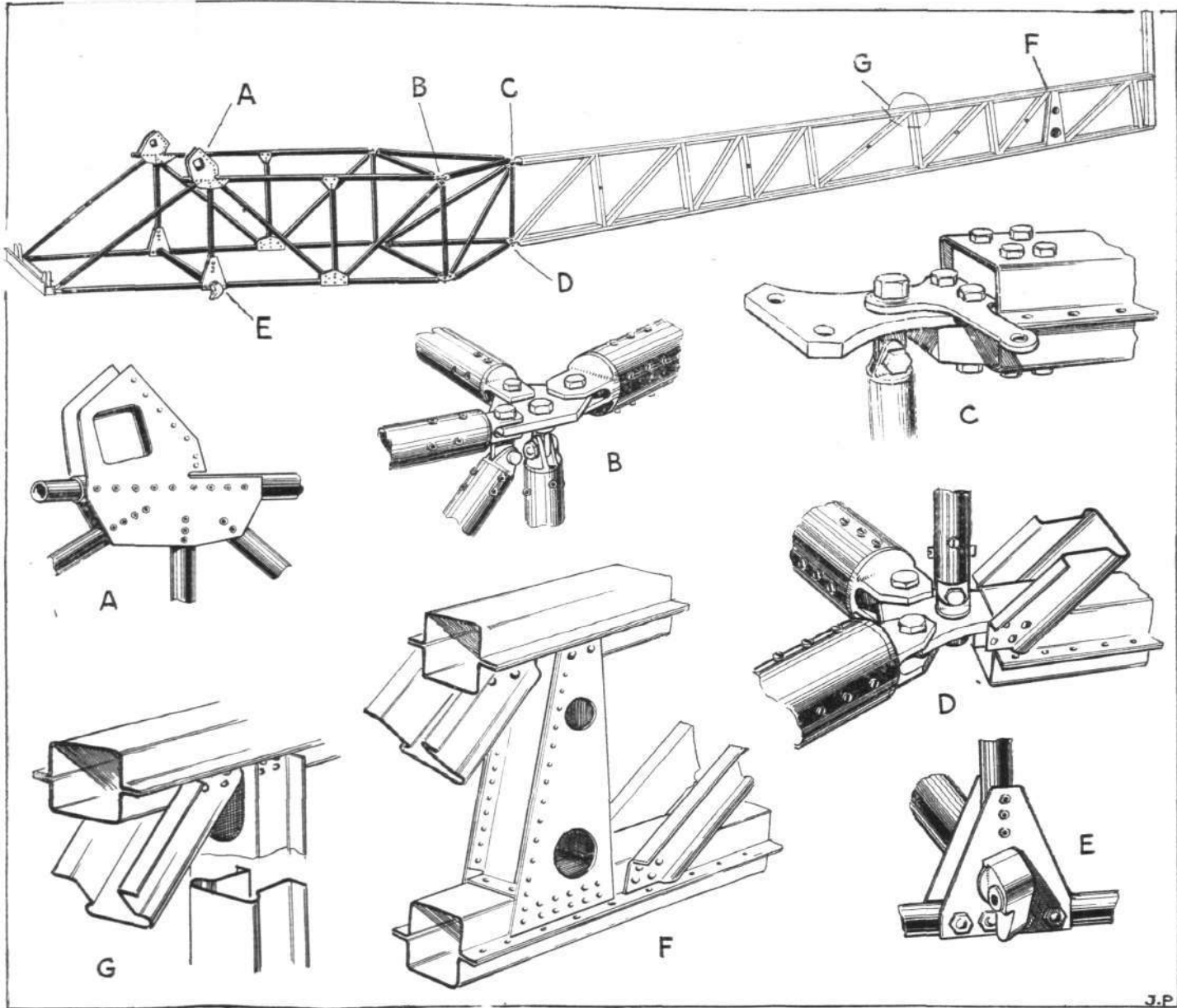


**REAR END OF THE FUSELAGE :** Details included are the tail-trimming gear and the castoring tail wheel. (FLIGHT Photo.)

the anti-drag wire joining the rear ends of the pyramid tubes can be omitted. This has actually been done in the ST.4, the leading edge being a horizontal U-section of duralumin, and carried on the front ends of the pyramid tubes. The trailing edge is formed by an oval section duralumin tube.

In the tip portion of the wing, the system changes from a monospar to a triangulated two-spar construction. The main spar continues to the very wing tip, and a rear spar, which supports the aileron hinges, is added in place of the tie-rod torsion bracing. This rear spar converges on the main spar, which it meets at the tip, and is a plain duralumin channel, with the closed side towards the aileron, lightened by circular flanged holes. The main spar also changes its structure in this wing portion, the spar booms being made up, over the inner part of the portion, of one-half of the standard built-up boom, covered with a flat strip. At the extreme tip the spar booms become open



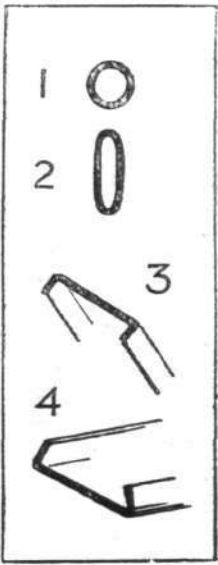
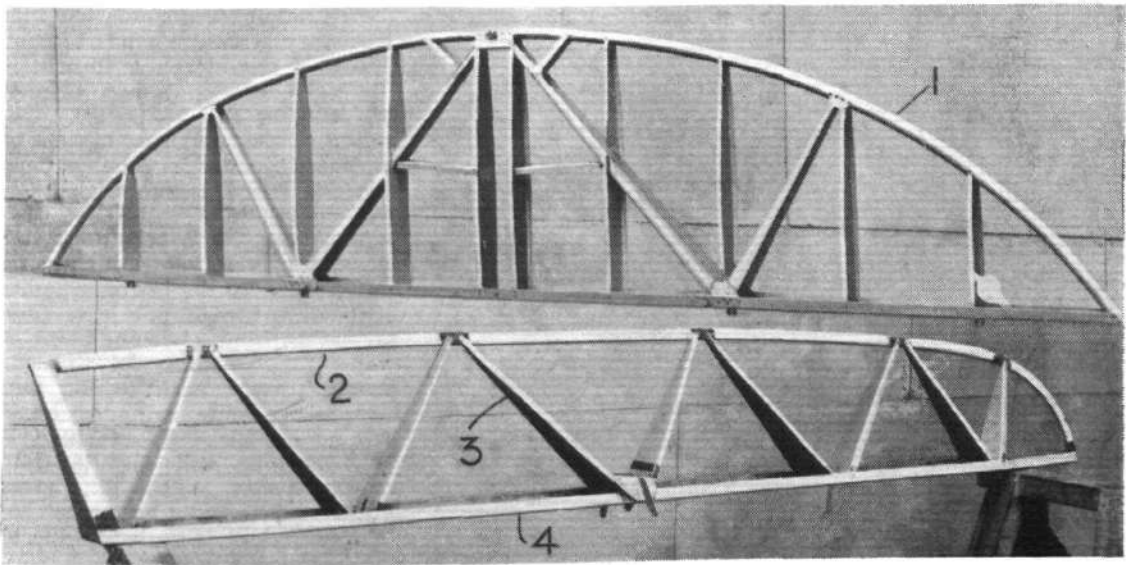


THE PRIMARY STRUCTURE OF THE FUSELAGE : The key diagram gives the locations of the details. The torsion bracing has been omitted. (FLIGHT Sketches.)

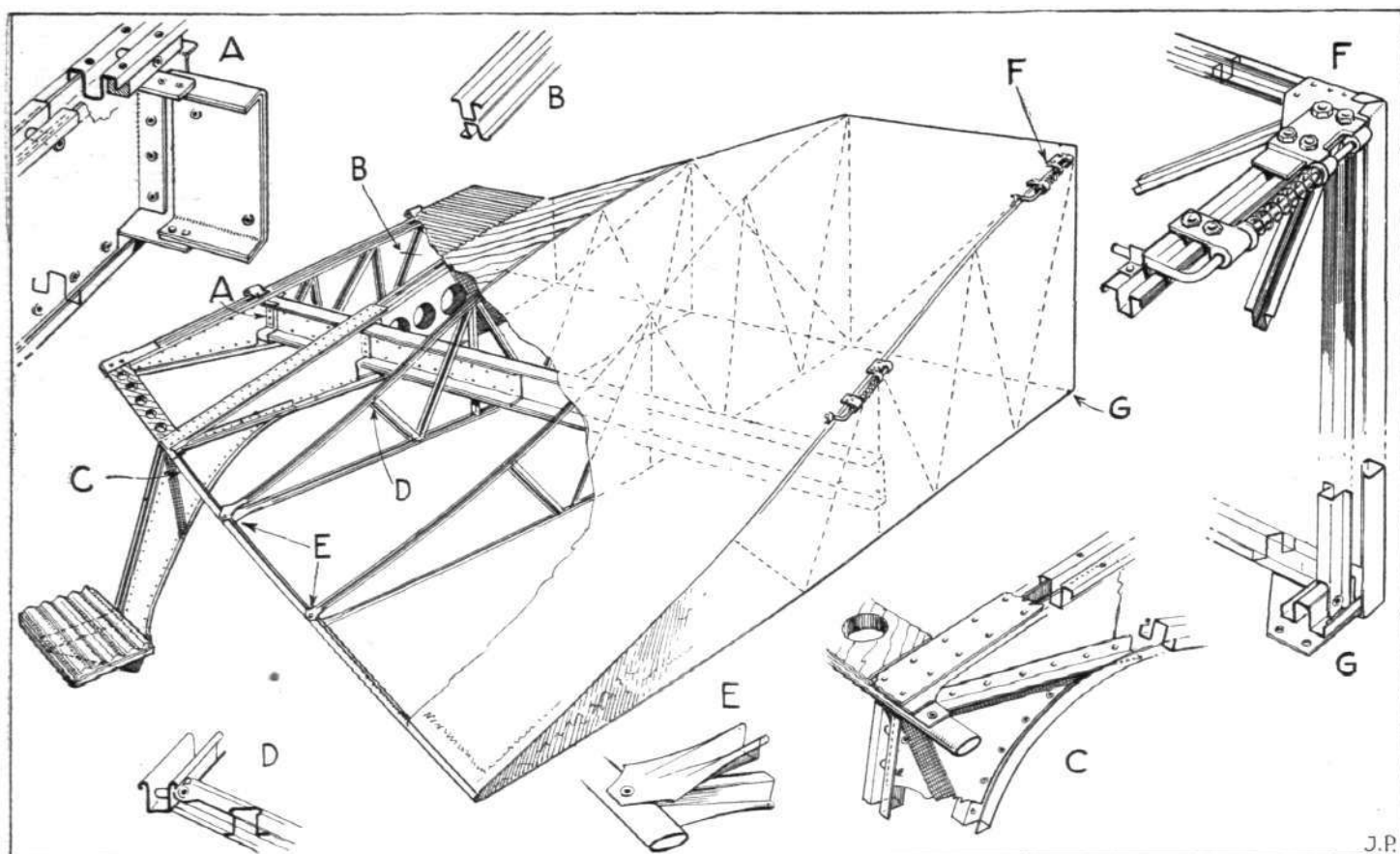
channels, the flat covering strip being omitted. The shear bracing in this portion of the wing is in the form of plain channel sections.

In the wing roots the type of construction is totally changed as a result of the presence of the two engine

mountings and the consequent break in the plain torsion bracing. The main spar becomes, in this portion of the wing, a forked member, the upper limb of which, in the form of a large-diameter steel tube, runs in a straight line right across and through the fuselage. The lower spar



TAILPLANE AND AILERON: The tailplane is shown in the upper photograph and an aileron in the lower. Details of the various members are shown on the right. (FLIGHT Photos.)



ON THE ST.4: The trailing portion of the wing roots hinges up alongside the fuselage to allow of folding the wings. It is in this portion of the wing that the lifting of the trailing edge occurs, the object being to reduce interference drag. A step on the trailing edge facilitates getting into and out of the cabin. (FLIGHT Sketches.)

boom stops short at the lower fuselage longeron, to which it is bolted, a corresponding cross member being placed in the bottom of the fuselage. The shear bracing takes the form of a diagonal member formed by two plain channel sections placed back to back, and spaced some little distance apart. Torsion bracing is provided by two tubes forming a horizontal vee with its apex on the leading edge, where this joins the fuselage structure. The leading edge of the wing roots is in the form of a circular section tube, covered with a duralumin strip of horizontal U-section, and this is continued across the engine mounting frame, of the structure of which it becomes a part.

The wing ribs are light duralumin girders having flanges of U-section with pronounced turning over of the free edges. The shear members or ties and braces are of a slightly different square U-section. The ribs are attached to the spar booms by very simple U- and L-section clips.

Ailerons and elevator, etc., are of very simple construction, with plain duralumin channel sections for the spars

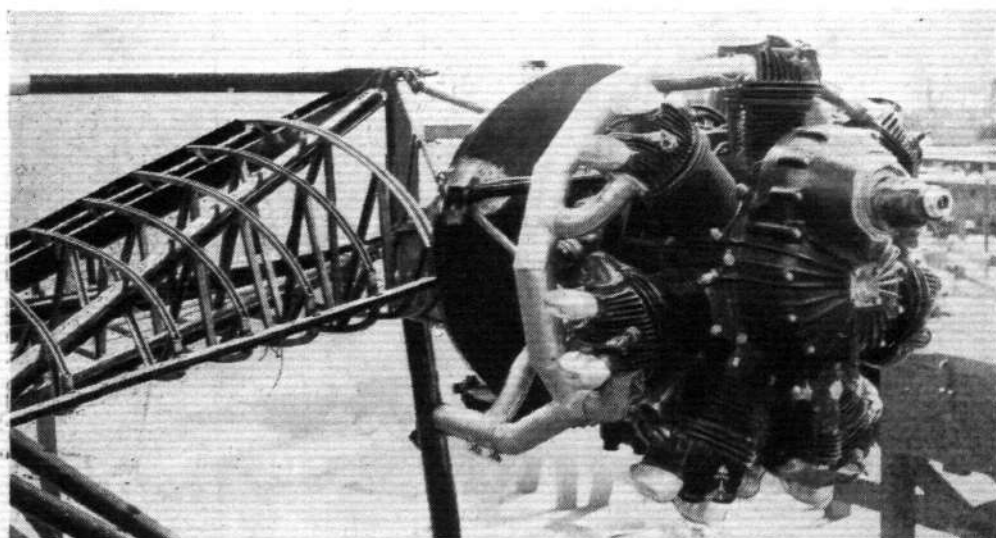
and ribs, and a large-size oval duralumin tube for the trailing edge of the ailerons, while in the elevator the trailing edge is a circular section tube.

The inner portion of the wing, adjoining the fuselage, is so arranged that it hinges around horizontal hinges on the fuselage side. Before the wing can be folded, this portion is hinged upwards until it lies flat against the sides of the fuselage.

### Fuselage

For an understanding of the fuselage construction it is necessary to refer to some of our sketches. The primary structure is in the form of a single built-up girder at the rear, forking just behind the cabin to form two side girders, which then converge in front to form the nose of the fuselage. The single girder at the back would not transmit very much torque, and a system of torsion bracing exactly similar in principle to that of the wing is employed. The whole primary structure is very simple indeed, but unfortunately the secondary structure tends to complicate it considerably, so that in the end one cannot help wondering whether this particular application of the monospar system is, in fact, justified. The attachment of the formers which carry the longitudinal stringers that support the fabric becomes somewhat involved, and it is, we think, open to discussion whether after all it would not have been preferable from a weight point of view to have continued the side members right back to the tail, introducing more orthodox panel bracing. That the machine is light no one will dispute (tare weight about 1,250 lb., gross weight 2,300 lb.), but much of the low weight is probably due to the wing construction.

The fuselage girder has top and bottom booms similar to those of the wing spar, but the



THE PORT POBJOY: Some wing root details may also be seen. (FLIGHT Photo.)



shear members are open duralumin channels with the free flanges turned over. The side members are tubular girders, duralumin being the material except for one tube, which may ultimately have to take the stresses of a float undercarriage, and which has therefore been made of steel. The fabric-supporting stringers are very deep U's of duralumin.

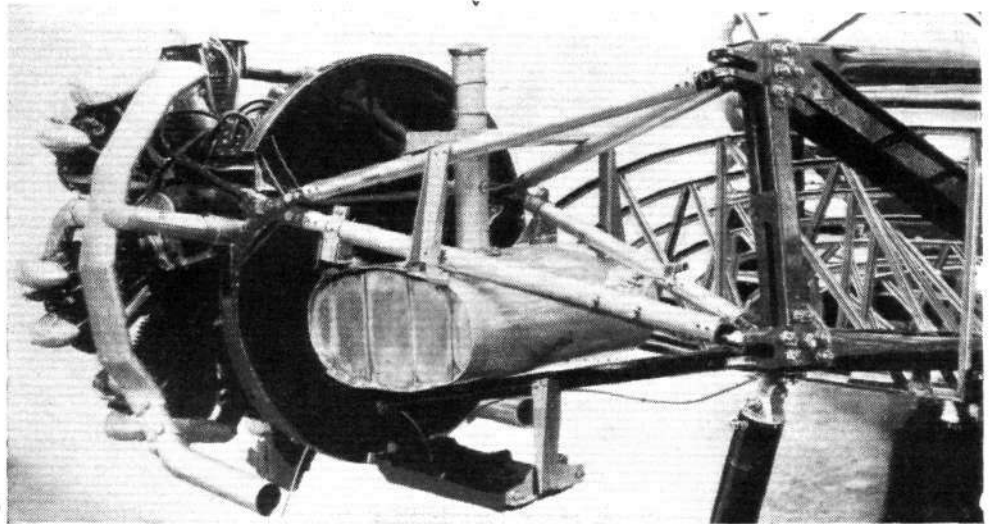
#### Power Plant

The two Pobjoy "R" engines are mounted *en porte faux* from the single wing spar. Two horizontal vees whose apices meet on spar and engine frame in such a way as to form a double wedge carry the engine mounting proper, which consists of steel tubes so arranged as to give triangulation. The whole engine attachment is free to swing laterally around the vertical hinges on the spar, but are prevented from doing so by the continuation of the leading edge which crosses the engine mounting framework.

The petrol tanks are mounted inside the wing, and straddle the wing spar. Each tank has a capacity of 21 gallons, and is made of tinned sheet steel, so that in the event of a leak during operation, anyone who can use a soldering iron can make the repair. The tanks are actually in the middle wing portions, so that to permit folding of the wings a length of flexible tubing connects with the carburettors. This placing of the petrol tanks does not give sufficient "head" to produce gravity feed when the machine is climbing and accelerating, and the petrol system therefore includes two A.C. pumps, the system being so arranged that either pump can supply either or both engines. All the engine controls are of the Arens remote type.

#### Undercarriage

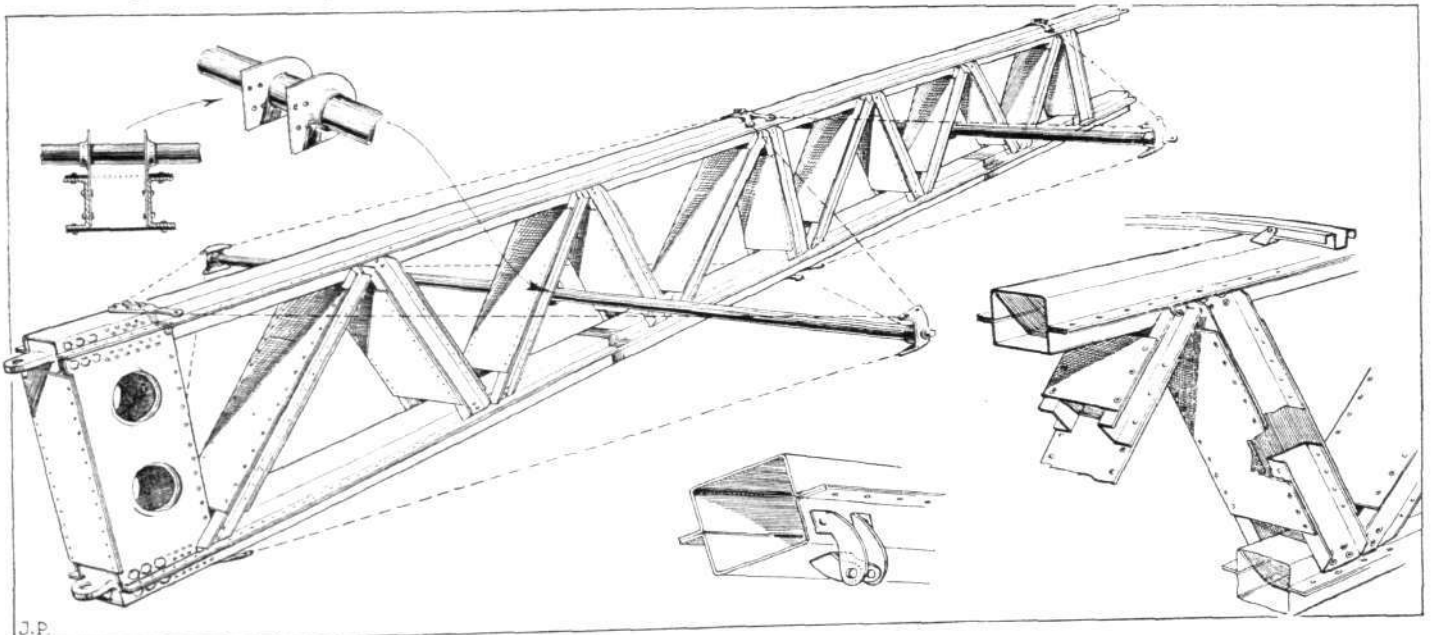
By making use of the new telescopic legs marketed recently by Aircraft Components Company (Mr. G. H.



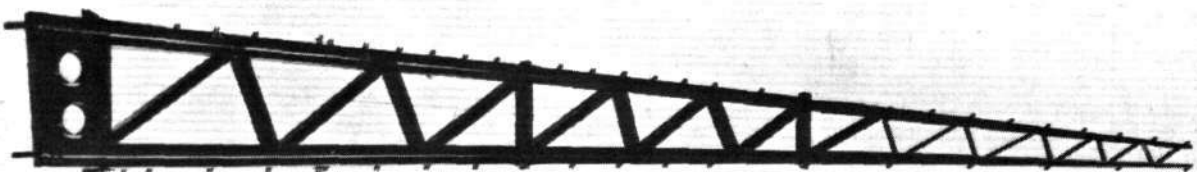
**ENGINE SUPPORT:** The engine plate proper is carried on four tubes forming a "double wedge," and prevented by a continuation of the leading edge from swinging laterally. Note the oil tank and cooler. (FLIGHT Photo.)

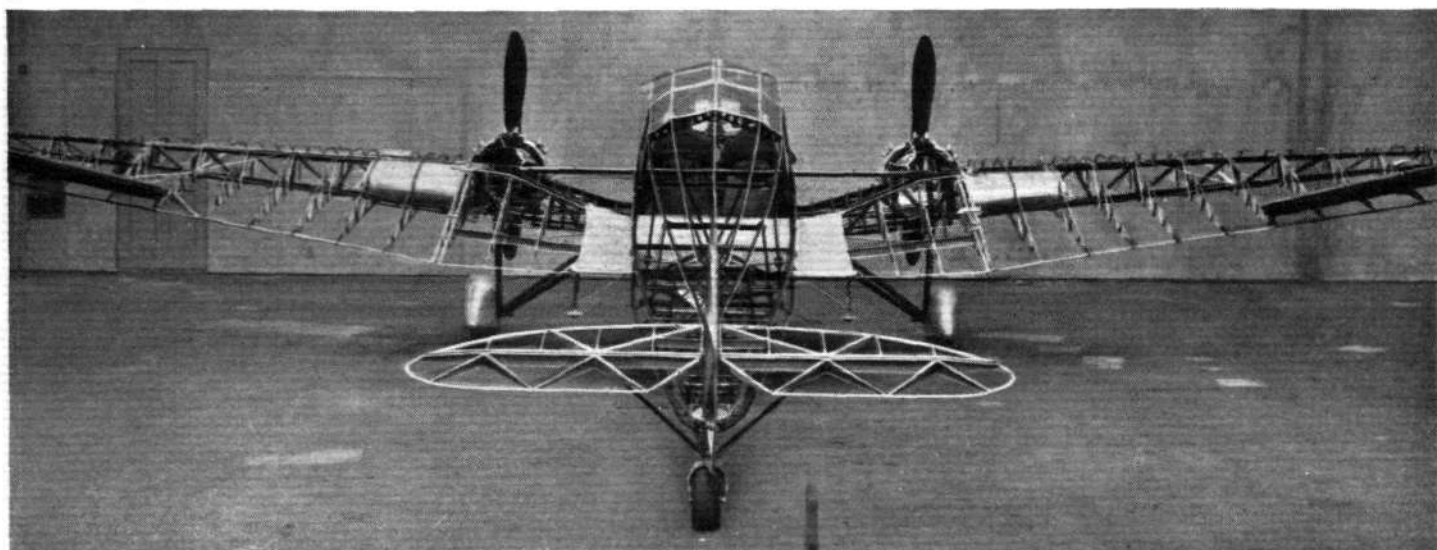
Dowty), it has been possible to design a very neat undercarriage for the ST.4. The telescopic legs incorporate coil springs for the actual aircraft load, and an oleo gear for checking bouncing. A feature of these legs is the exceedingly compact arrangement, which makes it possible to get the whole shock-absorbing mechanism into a circular tube of very small outside diameter. Each undercarriage tripod is completed by an axle and a radius rod, and further to reduce drag the wheels are partly enclosed in "spats." The wheels are Dunlops (19 x 7) of the low-pressure type (wired), and Bendix brakes are fitted. The brakes are operated by a lever centrally placed in the cabin, between the two "joy sticks." The lever applies both brakes, and for steering on the ground use is made of the fact that the engines are placed on the wings. A castoring tail wheel is fitted, the tyre being a Goodyear, 12 x 5.

It is not our intention to deal this week with the cabin accommodation of the ST.4 in great detail. It will suffice if we state that seats for two pilots are placed in front,



**THE SINGLE SPAR:** The photograph below shows the general arrangement of the shear members, while the sketches illustrate structural details. The small sketch at the bottom shows the rib-supporting brackets. (FLIGHT Photo and Sketches)





**THE POSTERIOR ASPECT:** This view, taken from immediately behind, shows wing construction, etc., rather well. Note the placing of the petrol tanks in the wings. The top boom of the wing spar continues right across the fuselage. (FLIGHT Photo.)

with a complete set of dual controls placed side by side, while the passengers are situated behind the wing spar, far enough to have very ample leg room. The seats are arranged side by side, and there is space for yet another seat on the wing spar, so that the machine could quite well accommodate five.

The flying controls are of orthodox type, with dual "joy sticks" and parallel-motion rudder pedals. The brake lever is, as already mentioned, located centrally between the two "joy sticks," where it is within reach from either seat. The instrument board contains Smith's instruments exclusively, but is not the standard Smith board, the width of the cabin being rather greater than in most machines and the available space therefore of somewhat different proportions. A sliding map tray disappears into the instrument board when not in use.

It is not often that one has cause to complain that a cabin is too light. In the ST.4, however, the windows in side and roof are so large that it seems quite possible that tinted blinds will have to be provided, especially if the machine is to be used outside Great Britain.

Owing to the position of the engines in relation to the fuselage, the view from the front seats is quite remarkably good. From the passengers' seats the wing obscures the view somewhat, but even so quite a good deal of ground can be seen, and, of course, the whole upper hemisphere.

Access to the cabin is by doors formed of combined fuselage sides and roof, the hinges being along a diagonal line on the fuselage side. Steps are provided on the trailing edge of the wing roots, although the wing is not very high above the ground when the machine is standing with its tail down. The wing root structure has been made strong enough to withstand walking on. The cabin floor is of plywood, carried on transverse fuselage members of I-section, built up from two channels of duralumin placed back to back. Light fore-and-aft stringers give the floor the necessary stiffness in the spaces between floor bearers. A comfortable feature of the cabin is that the floor is perfectly flat, *i.e.*, there is no curvature in it in any direction. All controls, etc., pass under the floor, which is left perfectly clear.



## THE LATE MR. WILLIAM GEORGE BELL

[The following is a tribute to an old, valued and well-known worker in aviation, which we are glad to be able to publish.—ED.]

**A**T Rochester, on March 29, 1932, there passed from this life William George Bell who, although only 62 years of age, had a record of years of service to aviation which few men can equal.

He was one of the first employees of Short Bros., joining the firm in 1909 at Leysdown, in the Isle of Sheppey.

Twenty-three years of service to a firm is not a remarkable thing in itself, but it is noteworthy in the still youthful history of practical heavier-than-air flight in this country and in the world.

When William George Bell joined Short Bros. as a mechanic it is doubtful if there were more than 100 employees in the whole aircraft industry of Great Britain, if indeed the construction of aircraft in those days could be styled as industry.

"Father Bell," as he became popularly known to the directors and his fellow employees, was an engineer of exceptional ability and resourcefulness, and an asset that any engineering firm would be glad to acquire. He took up aviation work in the very beginning of the science because he was himself a scientist of pioneering spirit and an inventor of no mean ability. He saw the vast possibilities of aviation when it was the subject of a joke to the multitude, and he knew that his talented hands could contribute to its progress, and so they did in very full measure. There seemed to be no problem of construction which he could not master, and whenever there was work to be done which required exceptional skill and initiative

it fell to his lot, and he never failed to carry it out successfully. He knew what it was also to work all day, all night and all the next day as was so often done in those early days, when every event in aviation seemed as important as the winning of last year's Schneider Trophy.

Bell was a deeply religious man, and he set a fine example to weaker souls in the discipline of his life, yet he possessed a great sense of humour and loved to sing comic songs at the staff dinner parties, which he did with great gusto and in a fine voice.

He was a great sportsman, too; was for many years the inspiring spirit of the firm's sports club, giving his time after work hours to its welfare, and taking an active part in its athletic competitions.

Every aircraft firm must number a few men of exceptional ability and long service to whom it feels its indebtedness. They are entitled to recognition as pioneers in the history of aviation, being on a parallel with the chief officers of those ships of old which sailed out into unknown seas. On them the captain relied for the leadership of gallant but raw crews.

"Father Bell" was of the type of that chief carpenter of the *Centurian* who was washed overboard when rounding Cape Horn in that early voyage round the world of whom the poet Cowper sings:—

No poet wept him, but the page  
Of Narrative Sincere  
That tells his name, his worth, his age,  
Is wet with Anson's tear,  
And tears by bards or heroes shed,  
Alike immortalise the dead.

H. O. SHORT.

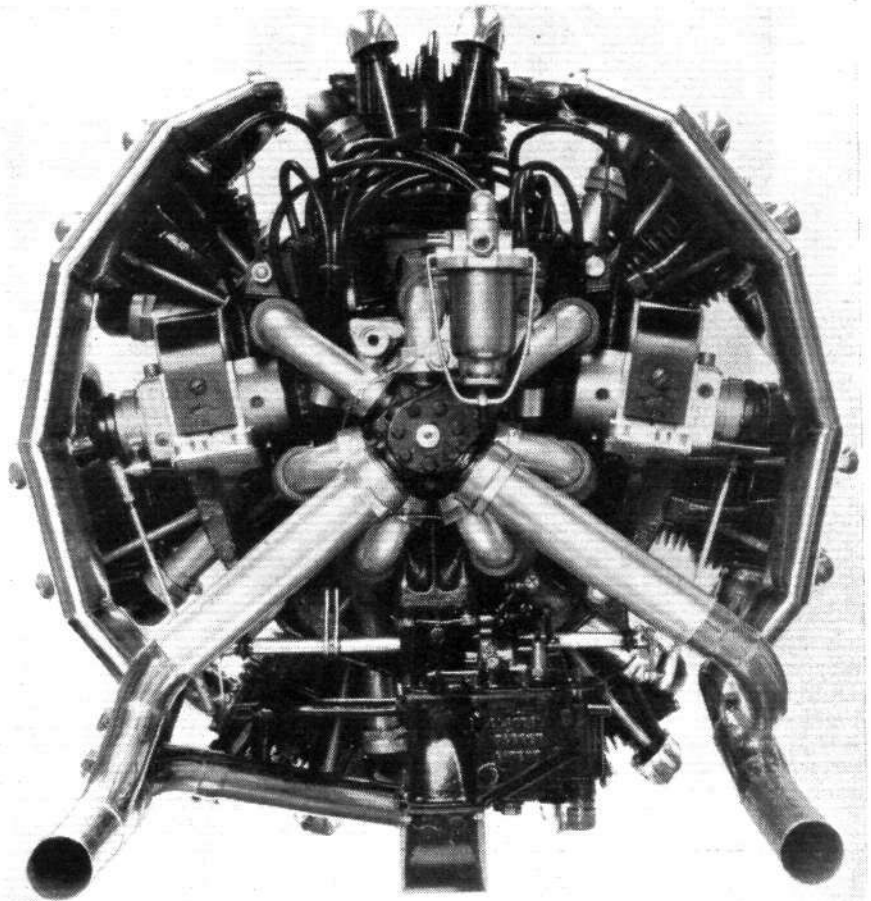


# The Pobjoy "R" Engine

**T**HE Pobjoy "R" engine made its first bow to the public in the race for the King's Cup last year. The engine was then something of an unknown quantity, but showed that it had the stamina necessary for a long race at nearly full throttle. Since that time this engine has made many notable flights in Comper "Swift" monoplanes, and can now be regarded as having definitely proved its worth. Hitherto Pobjoy Airmotors, Ltd., have not wished to have detail information published, preferring first to see the engine well established. This is now the case, and consequently we are able to place before our readers a good deal of information concerning this interesting little power plant. (A brief general description was published in FLIGHT of June 5, 1931.

Of the seven-cylinder radial air-cooled type, the Pobjoy "R" engine has a bore of 77 mm. and a stroke of 87 mm., giving a total swept volume of 2,835 cc. It develops 75 b.h.p. at a normal crankshaft speed of 3,000 r.p.m., and 85 b.h.p. is the maximum permissible power for 5 min., occurring at a crankshaft speed of 3,300 r.p.m. The petrol consumption at 90 per cent. of full power is 0.53 pint per b.h.p. per hr., and the oil consumption is 1.25 pints per hr. The weight of the engine (without exhaust collectors) is 135 lb., or 1.8 lb./h.p. on normal power, and 1.59 lb./h.p. on maximum power. Add to this the fact that a 0.47:1 reduction gear is provided, giving the opportunity for good airscrew efficiency, and it will be seen that the Pobjoy "R" is an engine likely to become extremely popular for a variety of aircraft types.

The light-alloy crankcase is in four parts, and carries the single-throw crankshaft on four bearings, a plain bearing in front, a large roller bearing on each side of the crank throw, and a rear ball bearing which locates the crankshaft endwise. The single crank pin is hardened, and on it runs the floating bronze bush of the master connect-



ing rod big end. The six articulated rods are linked to the master rod by a patented arrangement designed for efficient lubrication.

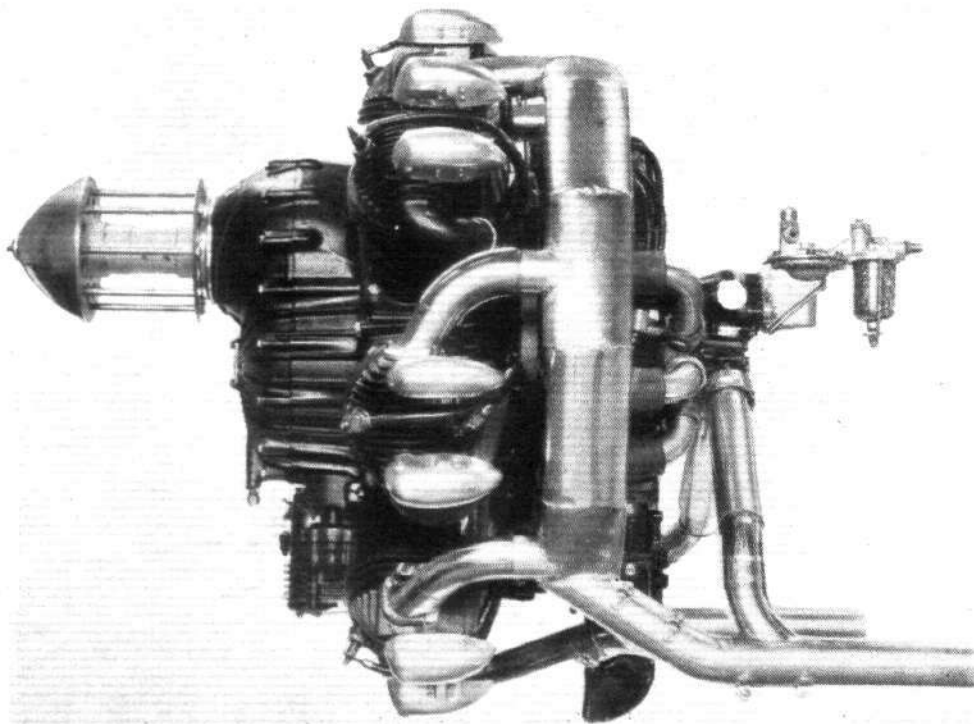
Slipper type aluminium alloy pistons run in steel cylinders, to which aluminium alloy cylinder heads are screwed. Each head carries one inlet and one exhaust valve, actuated by ball bearing rockers carried on patented brackets, which avoid expansion troubles. The rockers are dust-proof and self-lubricating, but grease attachments are provided for replenishing occasionally.

The airscrew reduction gear consists of a pair of substantial double-helical gears. A patented hollow flywheel is secured to the crankshaft, and serves the double purpose of steadying the drive and centrifugally filtering the lubricating oil.

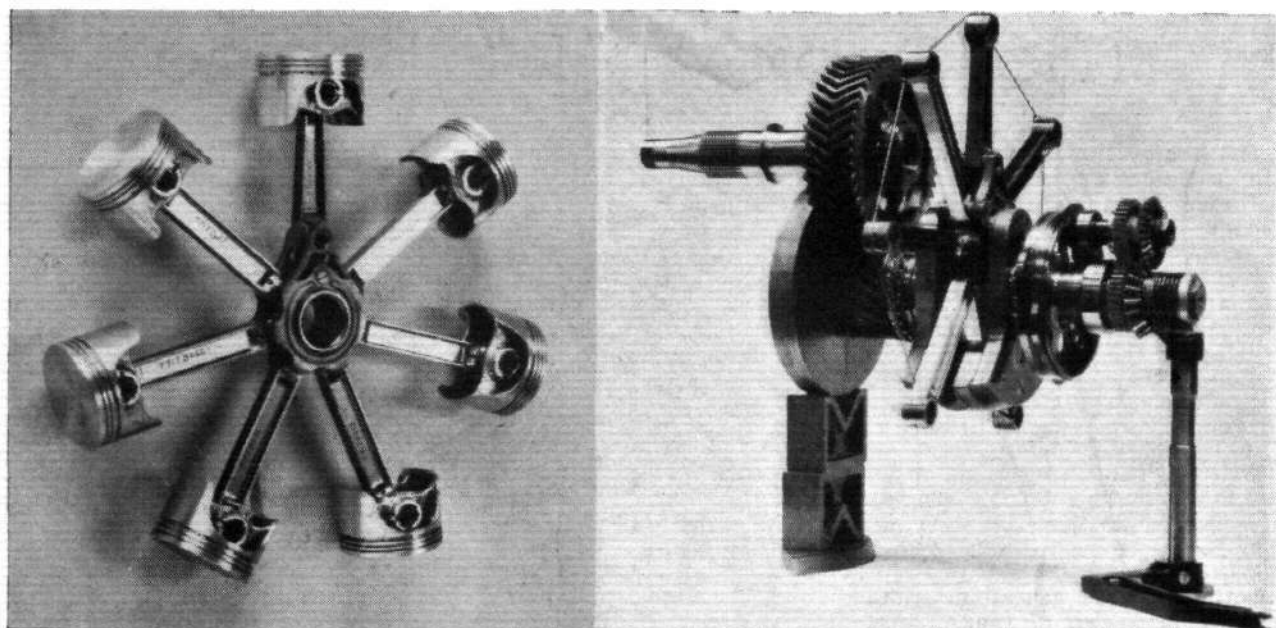
A duplex oil pump is mounted on the front of the engine, scavenges the crankcase and returns the oil to the tank, whence it is drawn by the pressure pump and delivered at 35 lb./sq. in. into the hollow crankshaft via the front cover. The big end bearing and the cam drum are supplied with oil under pressure, the remaining bearings being splash lubricated.

The two independent ignition systems comprise each a B.T.H. magneto firing its sparking plugs via a separate H.T. distributor. Shielded ignition can be provided for use with wireless.

The Claudel-Hobson carburettor is set for economy at cruising speed, but when the throttle is opened fully a special power jet is brought into action. A



**THE POBJOY "R" ENGINE:** This side view, and the rear view at the top of the page, show the very compact formation of this diminutive power plant, which develops 75 b.h.p. for a weight of 135 lb. and a volume of 2,835 c.c. The airscrew is geared to run at 0.47 crankshaft speed.

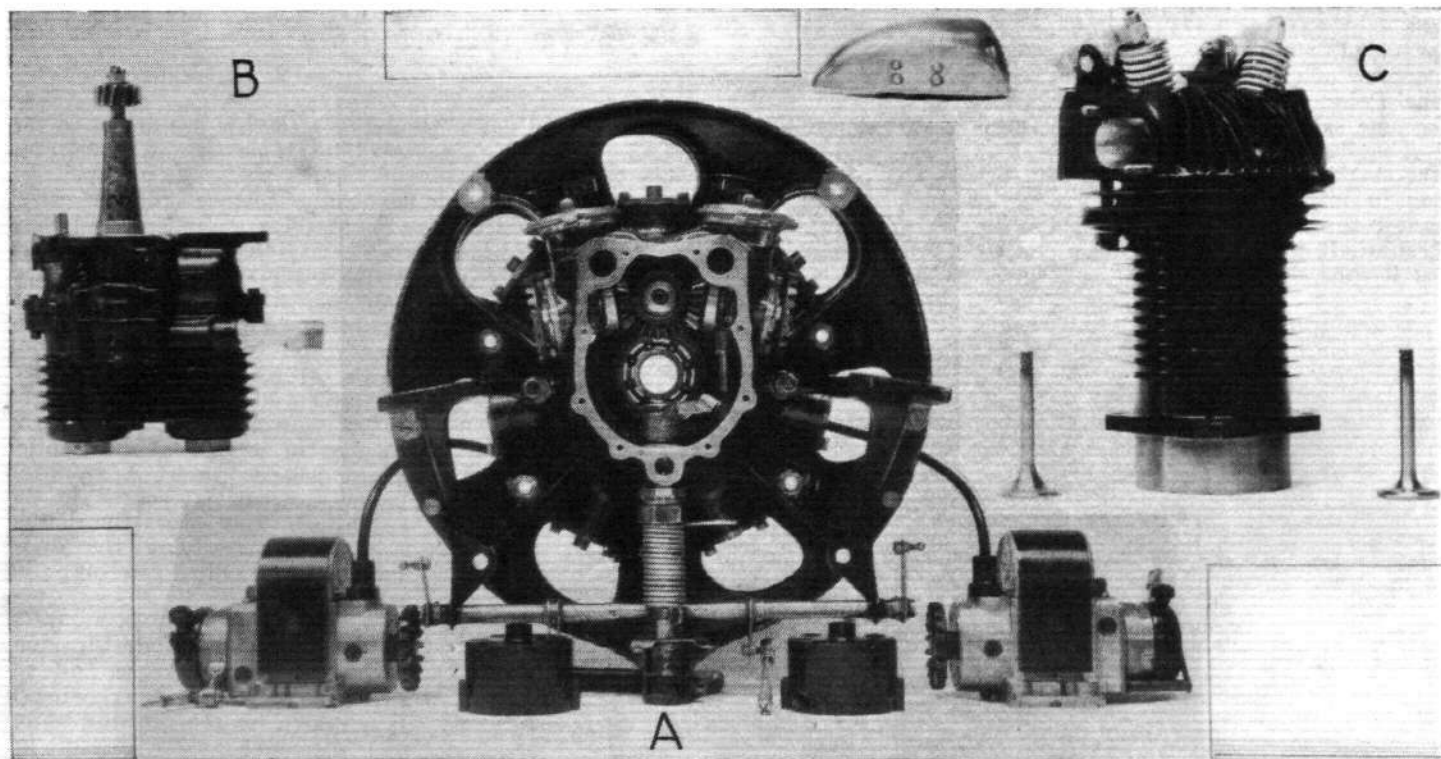


**THE POBJOY "R" ENGINE :** The connecting rod and piston assembly (left) is of orthodox type, with a master rod, slipper-type pistons, etc. The crankshaft, connecting rod, and airscrew gear assembly is shown on the right.

mixture control is provided for use at altitudes. A very neat exhaust collector system has been designed for the engine and is now a standard fitting. Designed to avoid expansion troubles, this collector ring is in the form of a polygon and has two sections, one taking the exhaust gases from four cylinders and the other from the remaining three cylinders. There are two tail pipes, one from each

exhaust ring sector. The exhaust collector ring is heavily plated with chromium all over.

Starting is by means of a hand-starting mechanism of the ratchet type, which disengages automatically when the engine starts to fire. The mechanism is entirely enclosed, and spring stops are provided, which limit the travel at both ends.



**SOME DETAILS OF THE POBJOY "R" ENGINE :** The back cover of the engine, with magneto drives, etc., is shown in A, the duplex oil pump in B, and a cylinder with its valves at C. The small inset at the top shows one of the "helmets" which enclose the valve rockers.



#### Autogiro Gets its C. of A.

THE Cierva Autogiro Co. inform us that their C.19 Mark IV open two-seater light land-plane, fitted with an Armstrong Siddeley Genet Major 100 h.p. engine, has now been granted a full and complete Certificate of Airworthiness by the British Air Ministry. This means that the machine is now licensed for public transport and is available for all flying schools, joy-riding companies and air-

craft operators. The C. of A. covers a loaded weight of 1,550 lb. The standard features of this model are:—(a) Mechanical starter for the rotor system; (b) large, easily operated front seat door; (c) dual control; (d) metal propeller; (e) low-pressure tyres; (f) wheel-brakes. Delivery for immediate orders can be effected by the end of June. Nine autogiros have been sold since January last when the C.19 Mark IV type was first put into production.



# Municipal Aerodromes

*This week we conclude our article on Municipal Aerodromes with details of Blackpool, Nottingham, Manchester, Liverpool, Plymouth, Portsmouth, and Stoke. The establishment of municipal aerodromes throughout the country is a matter of vital importance and one upon which hangs the rapid development of air traffic. Without an adequate number of landing grounds, situated within a comparatively few miles of each other, it is certain that flying will continue to be looked upon as a haphazard and uncertain business—hence the slogan of our readers should be “More Aerodromes”*

## BLACKPOOL

THE municipal aerodrome at this salubrious seaside resort is situated within two miles of the sea front. In area it is 120 acres, but it actually forms part of about 400 acres, spreading just outside the borough. This site was acquired by the Corporation under statutory powers in 1928 for aviation and sports purposes generally. It is not without its point to give the cost of the undertaking to the Corporation. It totals £39,000, comprising the following items:—

	£
Land, 120 acres	10,800
Lay-out .. ..	16,900
Hangar .. ..	3,500
Club-house ..	3,300
Approach road ..	4,500
	<hr/>
	£39,000

Among the several advantages enjoyed by the aerodrome, both natural and artificial, are freedom from fog (it does not suffer the habitual gloom shadowing most



Stanley Park: Blackpool's municipal aerodrome could hardly be closer and trams run to “the door”!

northern towns), and its attractive setting alongside Stanley Park, which entices the public with a boating lake, golf links, Italian and rose gardens, tennis courts, bowling greens, etc. Blackpool's call sign, the Tower, which is 500 ft. high, is, of course, a good landmark for the approaching airman, being visible on a normal day for 50 miles.

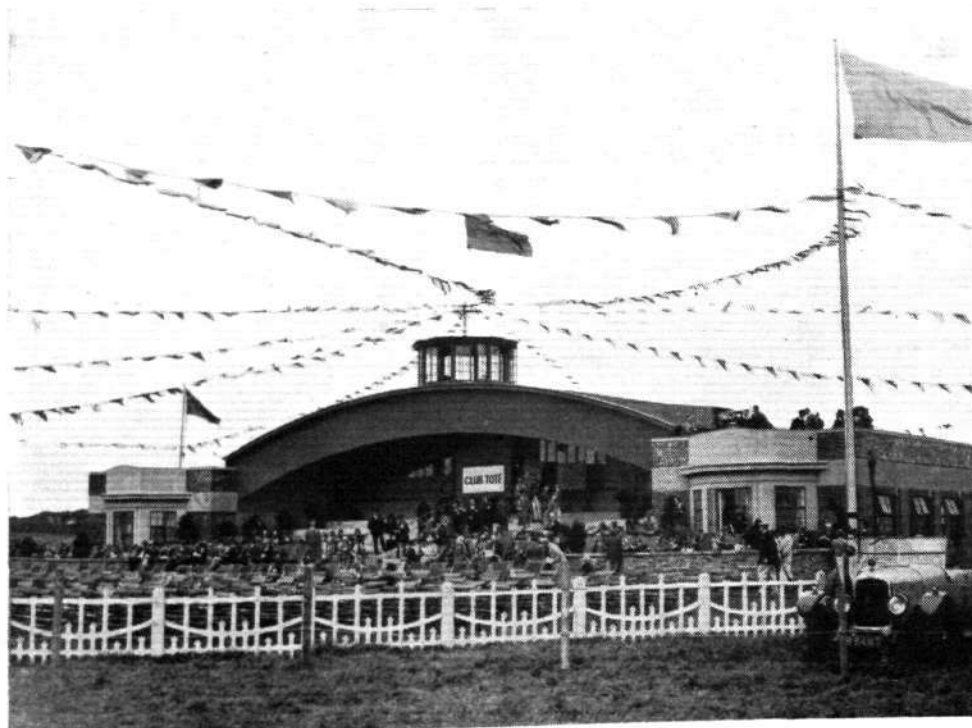
As regards accommodation, the hangar contains offices, store rooms, and a workshop on the north east side, and can store twenty light aeroplanes. Built of brick and artificial stone, the hangar is fitted with sliding doors 90 ft. long and 20 ft. high, and has a steel roof with a bituminous surface. A concrete apron has been laid down at the entrance.

Two hundred yards away on the north-west side is the club-house, also built of brick. It has an observation tower in the centre and comprises a separate large dining room and clubroom, bathroom, kitchen, bar on the ground floor, steward's room, offices, and three bedrooms on the first floor.

There is an approach road 40 ft. wide leading from the town. National Flying Services, Ltd., manage the aerodrome under lease from the Corporation, and the Blackpool and Fylde Aero Club, which has over forty flying members, has its headquarters at the club-house. So there are facilities for instruction, joy-riding and air transport.

Blackpool was one of the first towns to provide a municipal aerodrome, thus conforming to its traditional interest in aviation. In 1909 the Corporation organised the first international air pageant held in this country, in which all the leading pioneer airmen took part. Their international air meeting of 1928, which lasted three days, will still be in the memory of those who witnessed it.

At present, financial stringency is restricting the fullest development of this aerodrome, but it provides ample ground for extensions in the nature of hangars and run-ways, so that aircraft manufacturers would find no difficulty in being accommodated.



Being very close to Blackpool, where countless thousands take their holidays, Stanley Park is an ideal centre for joyriding and other forms of flying which cater for those in a holiday mood.

## NOTTINGHAM

**T**OLLERTON Aerodrome would seem, to some, to be far from the City, but in actual fact it is only 4 miles, its distance being a delusion due to the fact that the majority of the land to the South-East is purely agricultural and has not been developed for industrial purposes. The road runs quite close to the aerodrome boundary and an omnibus service passes along it to Nottingham.

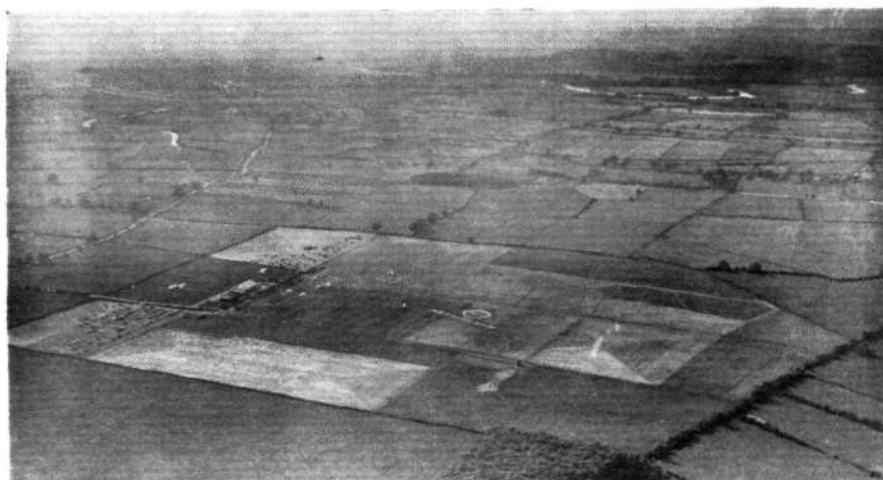
Railway facilities are not quite so convenient, as the nearest stations are  $3\frac{1}{2}$  and 2 miles distant, both are, however, connected with the aerodrome by good roads, that of Normanton being the nearer and on the Melton Mowbray line, while Radcliffe-on-Trent lies somewhat further north.

Waterways run quite close, and the Grantham Canal is only about  $\frac{1}{2}$  mile from the northern boundary of the aerodrome.

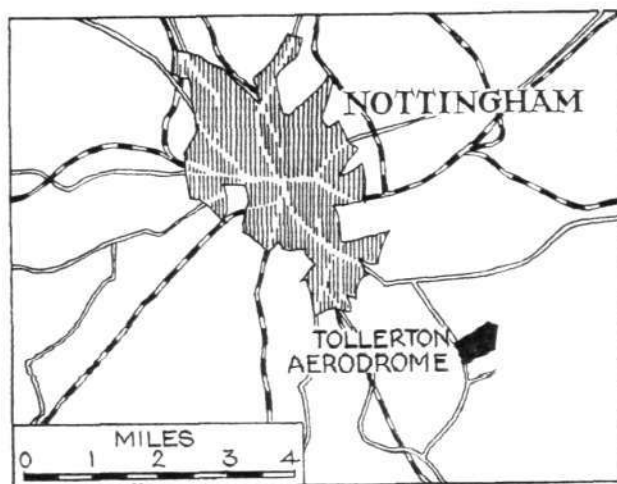
The River Trent runs between Tollerton and Nottingham, and is about 3 miles away at its nearest point. For road transport the aerodrome is admirably situated, as the Fosse Way is only a few miles down the Melton Mowbray main road; lorry traffic would, therefore, have no difficulty in reaching the aerodrome.

Ample land for the establishment of factories on long lease, and both electric current and water are further provisions at Tollerton, but at present there is no gas.

It will be seen, therefore, that the whole situation is admirable for manufacturers who desire to have their factories in quiet country surroundings, while at the same time being within easy reach of a large and important town.



An aerial view of Tollerton aerodrome which shows clearly how open the surrounding country is. (FLIGHT Photo.)



The municipal aerodrome for Nottingham is Tollerton, and it is excellently situated for the establishment of factories around it.

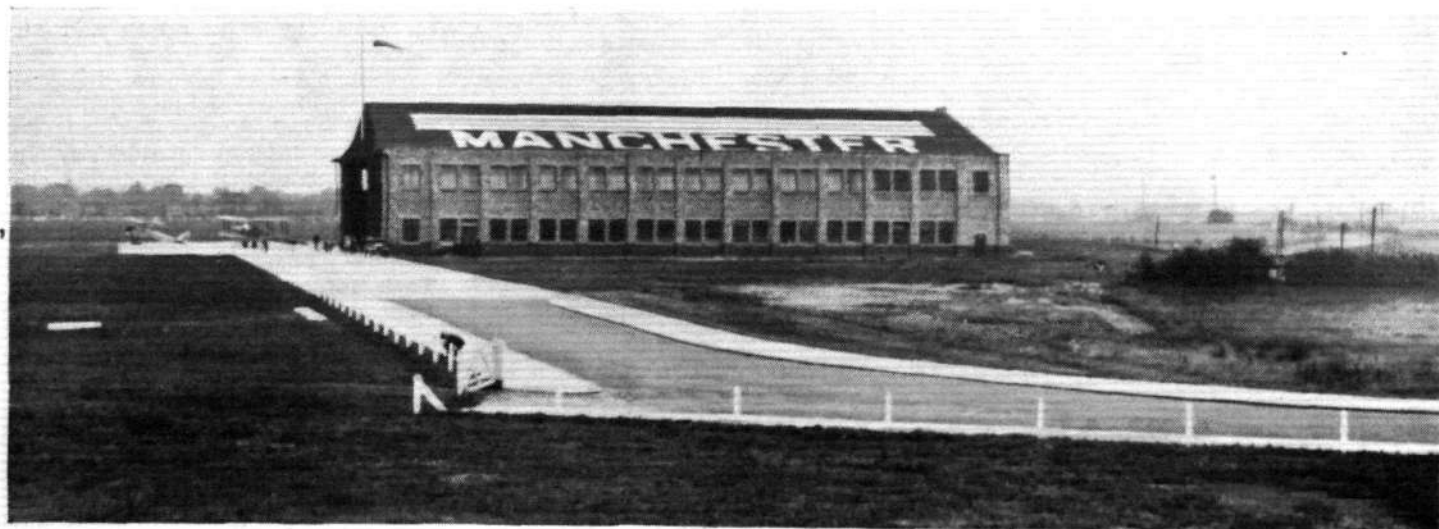
Tollerton is the home of the Nottingham Flying Club, and the aerodrome is operated by National Flying Services, Ltd., on behalf of the Nottingham Corporation. The buildings at present provided comprise the usual range as at all the N.F.S. provincial aerodromes. The club-house is very comfortable, while the hangar is large and accommodates, besides many privately owned and club aircraft, those of the Rolls-Royce Co., who maintain a Hawker Horsley and a Fairey III F as flying-test beds for their engines.

The flying club is growing rapidly and the amount of flying done by their pilot members increases every week.

## MANCHESTER

**S**ITUATED at Barton-upon-Irwell, on the main Manchester-Liverpool Road, the municipal aerodrome is about seven miles from Manchester, and its special landmarks are the Manchester Ship Canal, 300 yds. from the

southern boundary, and a cemetery on the eastern boundary. The name MANCHESTER is painted in white lettering on each side of the hangar roof, and the boundaries of the landing runways are marked with white boards, white concrete angle markings and crosses. The prepared landing area allows the following length of run: north-south, 550 yds.; north-east—south-west, 675 yds.;



Adequate hangar space has been provided at Manchester as this view shows. The utilisation of the roof as a sign post is a scheme which should be followed by every aerodrome committee.





The trams run right out from Manchester itself through Eccles to the aerodrome at Barton, thus providing easy communication with the busy centres.

east-west, 750 yds.; south-east—north-west, 500 yds. One large hangar has been constructed of brick and steel, and its dimensions are 200 ft. deep by 100 ft. wide and 30 ft. high. When the doors are opened there is a clearance of 30 ft. by 100 ft. A workshop has been constructed as an annexe to the hangar, 200 ft. by 30 ft. by 10 ft. clear. Northern Air Lines (Manchester), Ltd., have a staff of qualified mechanics for aircraft repair work of all descriptions.

Manchester has been approved as a Customs aerodrome, and when Customs facilities are required prior notice should (if possible) be given to the aerodrome manager.

That the aerodrome has already justified its establishment from the flying point of view is evident from the number of aircraft arrivals and departures during the last

two years. It was opened on January 1, 1930, and during that year there were 1,025 landings and 1,031 departures, and these figures do not take into account the numerous joy-riding flights. Incidentally they do include 78 landings and 78 departures made by Imperial Airways' machines when operating the temporary service between London, Birmingham, Manchester, Liverpool, and as a connecting line with the Continental services. In 1931, when this service was not repeated, the landings were 1,131 and departures 1,123.

The Corporation have erected a fully licensed hotel, adjacent to the aerodrome, which possesses ten bedrooms (each supplied with hot and cold water), dining room, lounge, etc.; and thus first-class accommodation is assured for visiting pilots and passengers.

Complete fire equipment, including a 45 h.p. motor fire engine, is installed, and there is also "first-aid" equipment.

Manchester's aerodrome manager, Northern Air Lines (M/c.), Ltd., and the Aeronautical Inspection Directorate for the north-west area of England have their offices at the aerodrome, and the second named have an agreement with the Corporation whereby they operate flying services as required. They maintain a fleet of aircraft and experienced pilots, always ready to fly passengers or goods to any part of the British Isles or the Continent. They also undertake aerial photography. Landing and housing fees payable at Manchester's aerodrome are similar to those in force at Croydon. There are two scales of payment, one for commercial aircraft, and another (and more moderate) for private aircraft.

Concerning future developments at Manchester, after lengthy negotiations with the Air Ministry on the question of providing wireless and meteorological facilities, a tentative arrangement has been agreed upon and has been recommended to the City Council for acceptance. If this is forthcoming it is expected that the facilities will be in operation during the summer, and will include the erection of a control tower.

Thus will Manchester become a leading air centre for the north-west.

## LIVERPOOL

**D**EPRESSING influences, of the kind which until recently have ruled the thoughts and actions of those in authority in almost all businesses, have also affected the development programme which was outlined for Liverpool's municipal airport at Speke.

When the City Council decided that they ought to have a landing ground for landplanes as well as their already existent Customs Seaplane Landing Area in the Mersey, they called in Sir Alan Cobham, who, with his characteristic thoroughness, undertook a survey of the neighbourhood, and eventually chose Speke as the most suitable. The report included a development scheme complete down to the last building, and its completion would have placed Liverpool in the forefront of these progressive municipalities which realise that aircraft will before many years play an important part in the welfare of their cities. However, depression ruled the day and that scheme has been held in abeyance for the present. Those who are interested in such matters should pay a visit to the R.I.B.A., 9, Conduit Street, W.1, where an exhibition is now being held of aerodrome plans and photographs, and there they will see the Liverpool plans as originally conceived, hangars, offices, hotel, workshops, etc., all laid out to the best advantage.

The area of the land reserved is large indeed, and comprises some 250 acres, owing to the hold up, however, only 159 of these acres are actually being held for aviation, the remaining

91 being looked upon as possible extension. Moreover, only 75 of the 159 have been surfaced and prepared for landing upon, and it is this area which has been licensed as a landing ground.

Buildings and other facilities are not being provided until it is seen that the volume of air traffic warrants the expense, and in the meantime the Liverpool and District Aero Club have an arrangement with the City Council whereby they may use Speke for instructional flying purposes, should there be any pupils on that side of the Mersey desiring it.

During 1930 Imperial Airways, in conjunction with the cities and towns concerned, ran a service from Liverpool to Croydon via Manchester and Castle Bromwich (for Birmingham), and, in spite of very difficult weather conditions, reasonable regularity was maintained. The patronage received did not, however, warrant its continuance, though it is hoped that it may be started again at a future date.

The aerodrome adjoins the river, and its extension down to the waters-edge will be a simple matter. This will enable sea plane hangars to be erected, and it is not difficult to visualise Liverpool in the future as one of the chief stopping places for Transatlantic Seaplane services, where the passengers will be transhipped to smaller land aircraft for expedition to London and other centres.

From the manufacturers' point of view, the environs of the aerodrome are excellent. A road from the City runs quite close, and it is but a few minutes drive to the centre, while the river leads to the waterways of the whole country. As Liverpool



Placed as it is on the banks of the Mersey, Speke Aerodrome may possibly be a potential terminal for Transatlantic flying-boat services.



is one of our most important seaports, it would seem only natural that it should ultimately become one of our foremost airports, and few things will further this

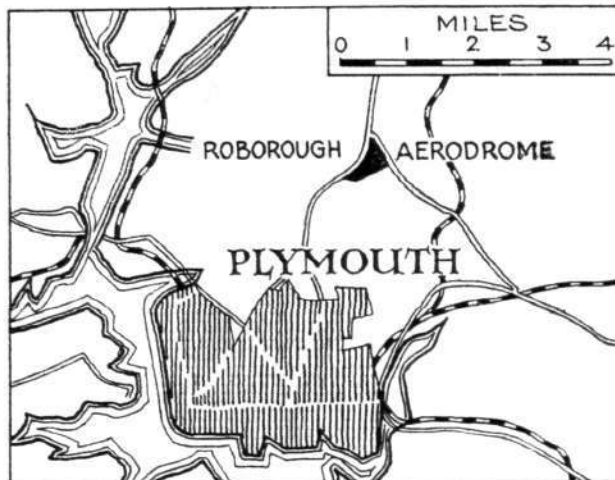
more effectively than the establishment of industries centred around its aerodrome boundaries, be they connected with aviation or not.

## PLYMOUTH

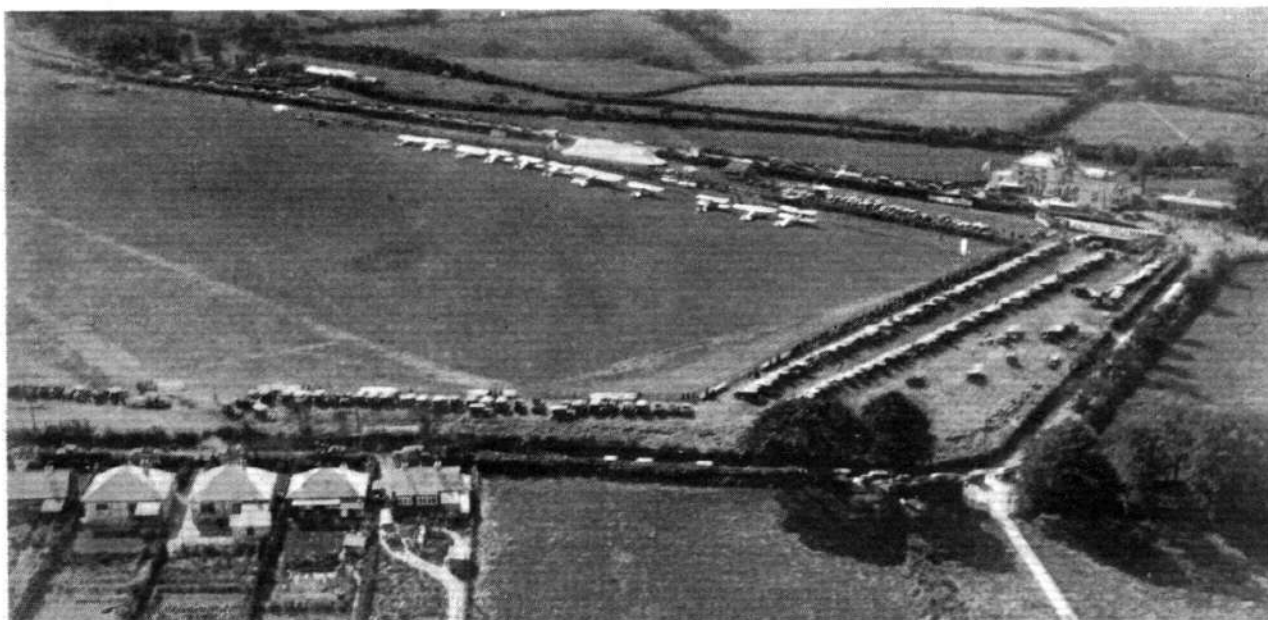
**B**LESSED with one of the finest harbours in the world, Plymouth has been a seaplane or flying-boat base for about 16 years. The Sound is a natural haven for sea-going aircraft as for ships, but there is, alas! very little seaplane flying by commercial or private airmen to-day; Plymouth, however, optimistically announces that seaplane moorings can be arranged in the Sound if notice is given in advance.

Its municipal aerodrome at Roborough is four miles north of the town on the main Plymouth-Tavistock-Okehampton Road, and is served by a regular bus service at intervals of 40 min. This service would be speeded up when the volume of air traffic warrants it.

The Corporation has completed the construction of one hangar containing an engine shop, a store, and offices, and the entrance has a clear span of 82 ft. Administrative buildings and additional hangars will be constructed on demand being made for them. If desired, the sites for future hangars can be rented for buildings. They are served with both electricity and water supplies.



Roborough, the municipal aerodrome for Plymouth, is conveniently accessible by road and lies amid beautiful surroundings.

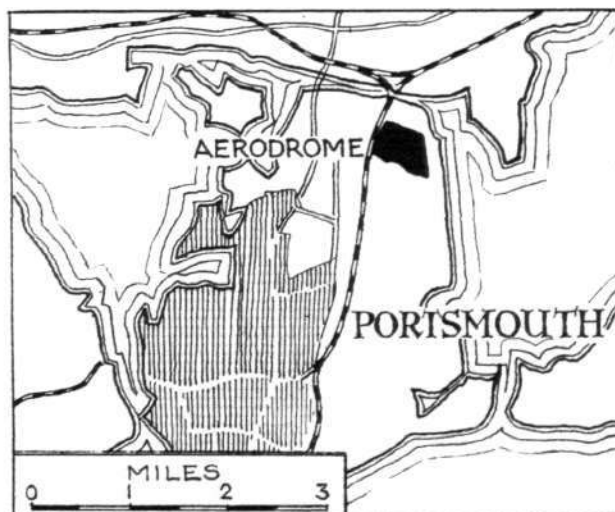


An aerial view of Roborough on the occasion of its opening by H.R.H. the Prince of Wales on July 15, 1931. The Coastal Defence Communication Flight, which was in camp on the aerodrome, gave a display during the afternoon.

## PORTSMOUTH

**T**HIS municipal aerodrome is situated in the north-east corner of Portsea Island. The total area of land acquired by the Corporation is 275 acres, of which approximately 200 acres will be landing ground having a minimum length of run of 800 yd. and a maximum of 1,300 yd. Approximately 75 per cent. of this ground has been prepared and is capable of bearing the largest aircraft. The work of preparing the first 160 acres has been entrusted to James Hunter, Ltd., of Chester, who specialise in the draining and levelling of aerodrome sites. Most of this area has already been taken over by the Corporation as conforming to the conditions of the specification prepared by Mr. R. J. Jenkins, the Portsmouth City Engineer.

In preparing this site the demolition of approximately 100,000 cu. yd. of old rampart fortifications, and the filling in of a moat with the materials obtained from them, have been necessary, and this work has been in the hands of Frank Bevis, Ltd., of Portsmouth. It is expected that by the beginning of July this year the whole of the 200 acres will be ready and in accordance with the Air Ministry's requirements. The cost of this initial prepara-



Its proximity to Portsmouth's centre makes this aerodrome an admirable one for sightseers and holiday makers who are interested in aerial matters.

tion will be £25,000. The aerodrome is bounded on the north and east by Langstone Harbour, on the west by the Southern Railway line, and on the south by an 18-hole golf course. A proposed route for the Eastern Road extension, which will mean a new route out of Portsmouth, will run alongside the eastern boundary of the aerodrome. Thus its situation is considered ideal. With the sea on two sides there is provision for a future seaplane base, and to clinch transport facilities there is the railway on another boundary. The golf course is at hand to provide pleasant

diversion, while a car journey for 12 min. brings one to the civic centre of Portsmouth, the Guildhall. Fifteen min. bus ride from the aerodrome takes one to the front at Southsea.

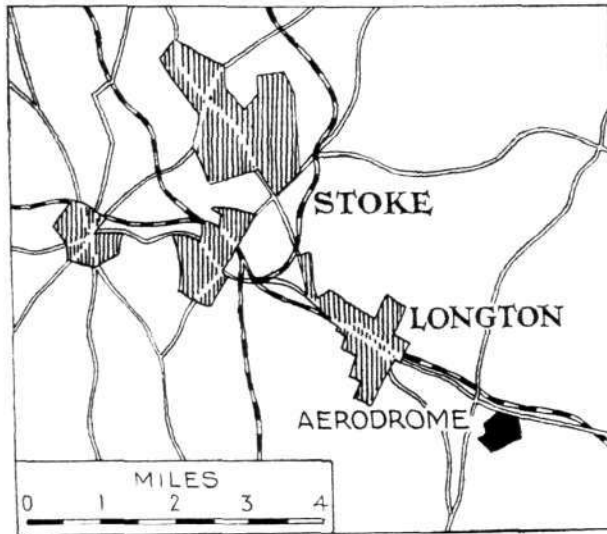
A clubhouse, hangar, and a service hangar, approximately 130 ft. square and complete with lock-ups and workshops, are to be erected, together with a restaurant, Customs office and other essential offices. Wider public interest than usual is to be stimulated by developing the pleasure side of the aerodrome on Continental lines.

## STOKE

HERE is another municipal aerodrome which began auspiciously by being declared open by H.R.H. Prince George—on July 1, 1931. At that date, however, the whole area reserved for the purpose was not ready, not even a small portion being available for flying.

Stoke City Council decided quite three years ago that "Stoke-on-Trent should be placed on the map in the aviation world." The district was well surveyed for a suitable site and the present one at Meir selected. About 185 acres were purchased, which permitted a runway of upwards of 1,000 yd., the shortest distance in any direction being over 800 yd.

The subsoil is a gravelly marl of a fairly open and porous character. National Flying Services, Ltd., reported favourably on the situation and the Council commenced the work of draining and levelling under an Unemployment Relief Scheme, thereby obtaining a grant from the Unemployment Grants Committee. It was a big task, for internal hedges and trees were uprooted, drains laid to take



Situated in the "Potteries," Stoke municipal aerodrome serves a wide area, and its position with regard to the town ensures that it shall be reasonably free from the smoke so prevalent in the district.

the water from various pools, hundreds of loads of soil excavated and deposited where required elsewhere, and in addition quantities of filling material had to be carted to the site. Ditches were piped and connections thereto picked up, and subsidiary drains laid where required.

The aerodrome is only one mile from Stoke in the south-south-east, or a 15-min. journey by car from the town centre. As the prevailing wind is south-west the site is not affected by the smoky area.

There is ample land available for factories on a lease of 23 years, and water, electricity and gas supplies are provided. Rates in this district are 17s. in the £ per annum.

National Flying Services, Ltd., have erected a hangar which holds 18 folded aircraft, and the Air Ministry, who granted a private licence for a portion of the site in 1930, now promise a full licence.

Stoke has incurred an expenditure of £32,000 in preparing this aerodrome, and like other towns which have provided municipal aerodromes they look forward to the development of air services between their city, London, and all the important centres in the country.

## AIRPORTS TO BE

FROM several of the towns which have purchased sites for municipal aerodromes, but not yet fully developed them, we have received reports which show the position to be as follows:—

Leicester has appropriated 154 acres of Corporation land and is at present considering plans for its preparation.

Carlisle purchased 264 acres of land adjoining the northern boundary of the city about two years ago, and they are ready to consider its development as an aerodrome "when necessary." We would suggest that "when necessary" applies at once. Even the small amount of inland air traffic active to-day must avoid towns that offer no convenient landing area. It cannot be too often repeated that aerodromes must precede air traffic.

Walsall was one of the towns which sought the advice of Sir Alan Cobham some time ago, and acting upon his recommendation they acquired a site of about 250 acres situated two miles from the centre of the town. Locally it is felt that in view of the close proximity of the site to the South Staffordshire industrial area, it could best be



This map on the right shows the position as regards municipal aerodromes in England:—

- Towns with licensed aerodromes.
- Towns which have purchased sites.
- Towns considering the purchase of sites.
- Towns with sites reserved.

developed on regional lines, and that is the basis upon which the Trade Development Committee is now proposing to act.

Within a radius of ten miles from the site there is a population of no less than two million, with a rateable value of ten million. The centre of Birmingham is only  $8\frac{1}{2}$  miles away, and Wolverhampton not quite that distance. So Walsall is wise in its proposal to proceed with a regional plan.

Doncaster is about to start work on a local site, aiming first at preparing a landing area. Draining and levelling will be the chief concern at this stage, the erection of buildings following when the land is ready.

Brighton, Hove and Worthing Councils have been negotiating for a site at Shoreham with the object of purchasing it and establishing a municipal aerodrome to be controlled jointly by the three Councils. Part of the site in question was used as an aerodrome before and during the War, and adjoins the existing aerodrome used by the Southern Aircraft Co., Ltd., and the Southern Aero Club. About 146 acres is the size of the area, and it is situated at Lancing, about six miles from Brighton,  $4\frac{1}{2}$  from Hove and four from Worthing, abutting at its northern end on to the Old Shoreham Road.

The main coast road from Worthing to Brighton runs close to its southern boundary, along which the bus service is excellent. Its southern boundary is actually the railway line, and there is a small station right on the south-western corner. It will be seen, therefore, that it is uniquely situated as regards communications. The River

Adur forms the eastern boundary, and although not a practice to be generally recommended, seaplanes have landed there at high water. The scheme upon which the Joint Aerodromes Committee is working will be a revolutionary one for this country, as they have realised that there is vast business to be done with transitory visitors at a properly conducted flying field where adequate facilities exist for eating and drinking while watching the flying—on the lines of many Continental aerodromes, in fact. Much attention is therefore being paid to the layout of restaurants, etc. The number of days per year upon which flying is possible at Shoreham is greater than almost anywhere else, and it is well within the bounds of possibility that this airport will become one of the starting places for cross-Channel traffic.

With this we conclude for the time being our description of existing municipal aerodromes, and our reports on the state of purchased sites. While recognising the difficulty of local aerodrome committees in their efforts to obtain the necessary funds for proceeding with their plans while the present misplaced plea for national economy prevails, we would urge those already in possession of sites at least to prepare them for flying purposes. Let them temporarily forgo the erection of costly buildings—apart, of course, from the essential hangar or two—rather than keep the land idle. To those towns that have yet to prepare their land, and intend doing so without delay, may we remind them that there are specialists at this class of work like James Hunters, Ltd., of Chester, and the En-Tout-Cas Co., of Leicester,

## Aerodromes

By JOHN DOWER, M.A. Cantab. [A.], Secretary R.I.B.A. Aerodromes' Committee

*A Paper read before the Royal Institute of British Architects on Monday, April 11, 1932. (Abridged.)*

**I**N 1929 a committee was formed to "examine and report on the architectural design of aerodromes." Its membership was made up of about equal numbers of architects and outside experts—representatives of the Air Ministry, Ministry of Health, Imperial Airways, aircraft manufacturers and so forth. Air Vice-Marshal Sir Sefton Brancker, Director of Civil Aviation, was the first chairman. His death, in the disaster to the airship *R101* in October, 1930, was a very great loss to the Committee, as it was to the whole world of civil aviation.

It was clear that the Committee could not logically confine its examination to the purely architectural aspect of aerodromes, and their first interim report, published in

the spring of 1931, was concerned almost entirely with the aerodrome as a land unit, having many technical minimum requirements—as to size, surroundings, levelness and smoothness of surface, and so forth. This report was widely circulated to local authorities, and in one case at least it proved a material factor in deciding that aerodrome work should be embarked on.

In both—the "early airway age" of to-day and the "early railway age" of a century ago—the initial and fundamental invention was the locomotive—the steam engine and the aeroplane. But an equally essential preliminary to railway transport was the railroad, with its engine sheds and stations. The early engines and rolling-stock have long ago become out of date and disappeared;



The main buildings at Croydon are old in comparison to others, yet from the aviation expert's point of view they still serve their purpose admirably. Architecturally they do not find favour with Mr. Dower, however. (FLIGHT Photo.)



but the permanent way and most of the buildings are still there and, with many patchings and additions, still in service. I need not waste time in commenting on the many glaring and harmful inefficiencies that have arisen from lack of planning in this railway groundwork.

In exactly the same way aviation cannot develop without an adequate groundwork. Airways are far less costly and less destructive of amenities than railways; but aerodromes, the "stations" of air transport, are even more necessary than railway stations; their frequency and efficiency are even more essential to service and safety; they cover a far greater space and involve buildings and equipment quite as complex and expensive.

In my view, aviation all over the world, most of all in this country, is growing less quickly than it might, largely from lack of adequate groundwork. There can be no doubt that we need many more aerodromes in this country and throughout the Empire. It would seem that public ownership of aerodromes would be the best guarantee of general availability, permanence and disinterested service. Good aerodrome sites, rightly placed close to towns, are rare and subject to constant threat of development for other purposes, and times are over-ripe for the selection and reservation of a large number of sites with suitably zoned surroundings.

Since the publication of their interim report, the Aerodromes Committee have been working on the architecture of aerodromes. I have made on their behalf three tours of inspection of Continental aerodromes; and Mr. Dawbarn has made a thorough tour of inspection of aerodromes in the United States with Mr. Norman. On these tours of inspection to a considerable extent the final report of the Committee will be based. It is now in active preparation, and will, I hope, be published in book form before the end of the year.

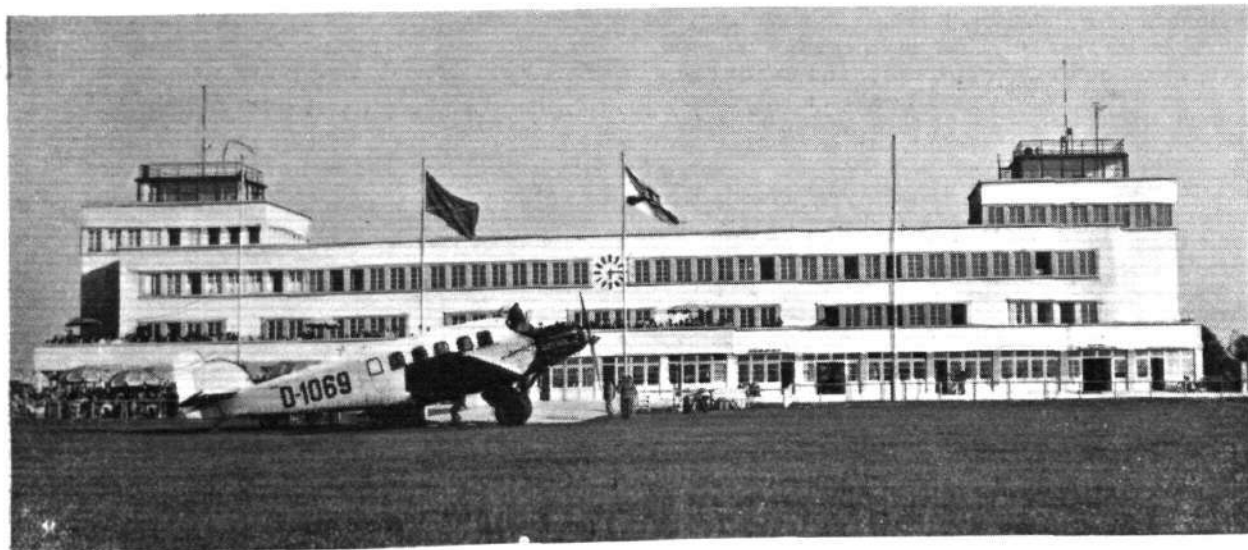
Aerodrome buildings fall into two classes: hangars and workshops to house and serve the aircraft; and what, for lack of a more precise name, I shall call stations to house and administer the traffic of all kinds—passengers, freight, mails, sightseers and staff.

It is clear that to provide a run of any requisite length in all directions in an open field, a roughly circular, or failing that a square, shape will be the most economical. At both Hamburg and Lübeck-Travemünde a circle of 1,000 metres diameter would cover the landing



At Hamburg the whole layout follows the curve of the field and is admirably related to the new arterial road. The station is a fine and virile piece of brickwork design in which road entrance and staircases are well expressed. Chief features of the plan are the splendid traffic arrangements of the ground and basement floors, every class having its own straight-forward route; the enormous restaurant covering the whole first floor; the recessed ranges of sightseeing terraces on the field side; and here is the truly magnificent effect given by a view along the main sightseeing and café terrace.

ground. An aeroplane rises and lands at a comparatively flat angle (1 in 15 is the working rule of the Air Ministry, with 1 in 10 as an absolute minimum), and this would imply that all obstructions should be set back from the



One of the "strongest" buildings from the architectural treatment point of view is the station building at Munich. It would, however, seem excessively high for the purpose.



Among the newest of our own aerodrome buildings is that at Brooklands. Built to the designs of Mr. Graham Dawbarn, it certainly looks most suitable from outside—the interior is equally suitable and exceptionally well arranged. (FLIGHT Photo.)

marked-out landing space by a distance equal to 15 times their own height—an ideal that should be turned into practice. But often it is not possible, and in such cases two general requirements affect the layout: the first is that the main mass of buildings should be placed parallel to, and not across, the prevailing wind; the second is that "flying gaps" clear of obstructions to a width of at least 200 yards should be provided at intervals all round the field. No wastage of space need be involved by these restrictions on the placing of buildings. The space in front of buildings is fully used for the taxi-ing about and waiting of planes; the spaces between buildings can be economically used as public enclosures for sightseeing or as car parks.

Convenient relation to road, railway or waterway traffic is most important. Both Berlin and Amsterdam provide admirable examples, not only of relation to existing roads, but also to new roads in process of development. The Schiphol aerodrome is considerably more than an ideal distance from the centre of Amsterdam; but future development will place the field at the crossing of new main trunk roads with quick direct connection to Amsterdam, Leyden, The Hague, Harlem and other towns.

The Tempelhof aerodrome of Berlin is unrivalled for its proximity to the centre of the city. It covers part only of a huge pre-war parade ground. Most of the rest has been wisely laid out as open space for public parks, playgrounds and the like. Traffic connections are excellent. Roads new and old lead from the field to the shopping, administrative and business centres. A main canal dock is not far away to the north. Stations on the main ring railway, the underground and the tramways are all within a few hundred yards of the main entrance.

In the United States only very rarely can a grass surface be found or made good enough to stand up to the wear of aircraft wheels and tail skids, and an artificial surface must be prepared of some wear-resisting, dustless, and resilient material; concrete, tarmac, and crushed rock or ashes or even the natural earth with an oil dressing have all been tried. The cost of such treatment over a whole aerodrome would, at present, be prohibitive, and the traffic is therefore canalised to a certain number of "runways." It is assumed as a basis that aircraft can, if necessary, land or rise up to  $22\frac{1}{2}$  degrees out of the wind; and the normal provision is therefore of four runways intersecting at 45 degrees to each other.

When weight of traffic makes grass inadequate, I look myself rather to an artificial surfacing of the whole field rather than to a system of runways; though, to save surfacing, the field itself may become star-shaped with eight or more points leading out to clear flightways. The buildings would perhaps come forward in V-shaped groups into the spaces between the star points.

Let us now consider the individual buildings. For small aeroplanes, the hangar is much like any other shed—a light steel or wood frame covered with corrugated steel or asbestos sheeting, or even boarding and felt.

The hangars at Tempelhof, Berlin, are typical examples of the larger hangars for commercial planes of all sizes which are to be found at any big Continental airport.

The effective size of a hangar is the size of its clear door opening. At Tempelhof is a series of four door openings each about 150 ft. wide by 25 ft. high. Here is a considerable engineering problem normally solved in Europe by placing a main lattice girder of box form over the doors and running subsidiary girders from it to the back wall. All height in the hangar above that of the doors is virtually waste space; all unnecessary height creates an unnecessary obstruction to flight. It is a cardinal principle of aerodrome design that all buildings should be kept as low as possible. Hence truss forms must be of the minimum practicable height in relation to their depth; a proportion of 1 to 10 should be secured. The third need of the hangar is that adequate workshop, store and staff space should be attached; it is more usual to place this accommodation at the back or side, but at Tempelhof it forms a central mass to the series of openings. The whole mass is very fine; but there is no excuse for the flag poles and lamp standards—dangerous excrescences of this kind should be abolished from all parts of an aerodrome.



Hannover is an example of the station building being placed at the end of the hangars and attached thereto. It looks somewhat severe, and gives the impression the interior accommodation would be cramped. Skilful arrangement has, however, mitigated this to some extent.





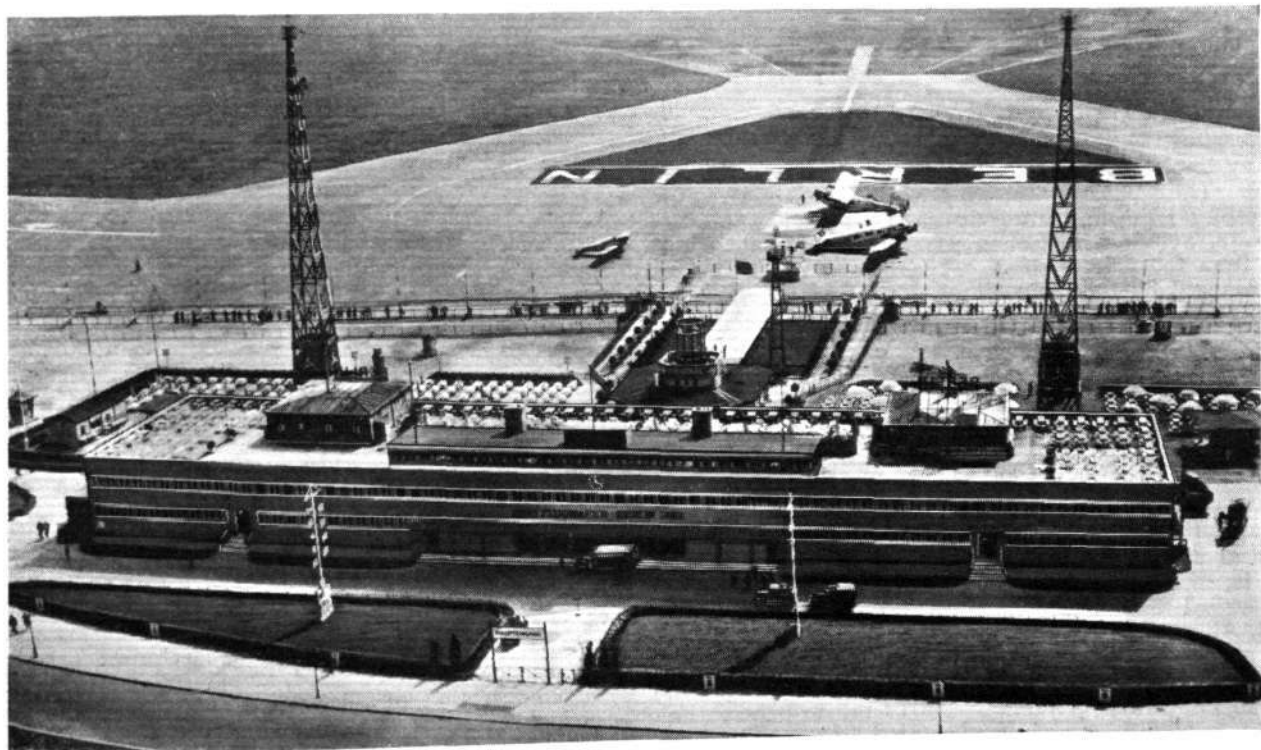
An unusual structure is the station building at Alhambra, California. It conforms to the general architectural design of that part of the world and is thus in keeping with its surroundings.

If, the expense of the doors, which may include additional heating cost, can be borne, there is good reason for the "through" hangar with doors at two opposite sides, as at Roosevelt Field, New York. I regret to say, in most of the American aerodrome work which I have had the opportunity of examining, one misses the vigorous seizing of the essentials of structural form that is typical of Continental work. It is in engineering inventiveness that the Americans lead, of which the hangar at Burbank may be taken as an example. The door opening is, I believe, a "world-beater," being rather over 300 ft. clear; and the doors themselves neither slide nor fold, but are counterweighted to open outwards and upwards in sections under electric power. This is a "through" hangar, with doors at each side, but the 300-ft. space is not clear through. The trusses are cantilevered out from four internal stanchions, which break up the floor space. A really large aircraft could be put in for the night—backwards!—but

couldn't be run right through. The larger of the two hangars at Hamburg, with the more modest provision of sliding doors on one side only, has a clear span of 260 ft. to its full depth of 130 ft., and may perhaps dispute Burbank's title to world pre-eminence. One more large hangar—that of Munich—must be shown for the magnificence of its engineering form. Europe here is not outdone by America, for there are doors on three sides—two 200-ft. and a pair of 110-ft. spans. The naked steel frame has an infilling of glass bricks, which helps to make the interior splendidly light.

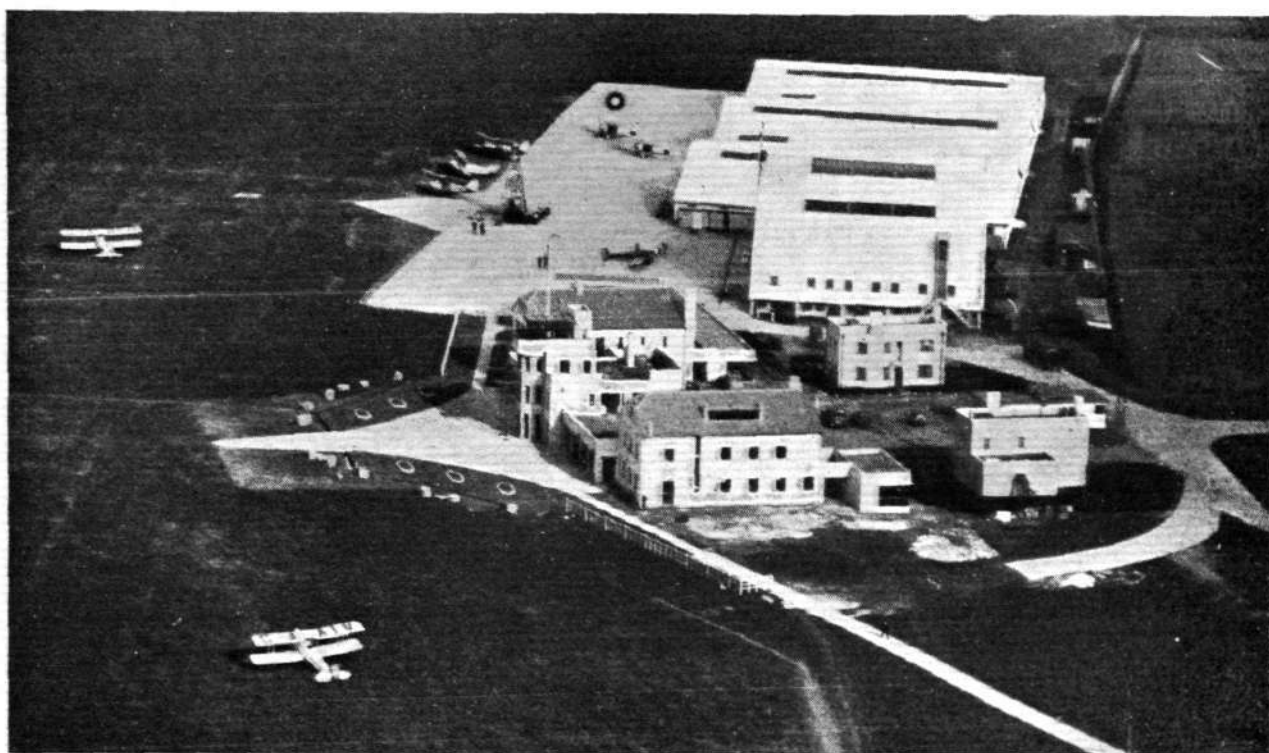
The main hangar of Heston Airport uses reinforced concrete in bow form with striking effect for a door opening of about 100 ft. But the bow form, natural to reinforced concrete, tends to extra overall height (here used in part for offices); and steelwork has this great advantage, that it is easy to alter, to adapt and expand, if necessary to dismantle and re-erect elsewhere, while reinforced concrete is almost impossible to alter in any way short of complete destruction and is notoriously one of the most difficult of all materials to destroy.

I must now turn to the more complex problems and needs of the aerodrome station. At Croydon the essentials of the building are fairly clear; so much covered space for halls and offices, with, first, a thorough provision of ways in and out at each side for different kinds of traffic, and, secondly, a room at the top with a clear all-round view of field and sky from which all flying operations can be controlled. The Croydon control tower is admirably equipped and soundly planned; the Croydon traffic circulation is scarcely so satisfactory. The main booking hall, entered direct from the road, is well arranged with the counters and offices of the various air lines at either hand; its appearance is symmetrical and decent, but very dull. From the hall forward to the field, however, everything goes wrong. The only restaurant accommodation is a ridiculous little coffee stall badly lighted from one of two light areas which only a far too great depth of plan makes necessary at all; the passenger traffic routes are needlessly long and circuitous.



Berlin has been designed from the start for expandibility; it has already been twice extended and the architect's most recent perspective shows still greater expansion, with much smaller and less dangerous wireless provision; nearly the whole of the ground floor is given up to sightseeing accompanied by eating and drinking; the building would include a cinema lecture room and a hotel of considerable size.





In its latest development Heston is the most advanced of our smaller airports. The accommodation added to either side of the control tower includes bedrooms and a greatly enlarged restaurant. The bow form main hangar in reinforced concrete is on the far side of these buildings, between them and the low private-lockup hangars. (FLIGHT Photo.)

Much, of course, must be excused to a pioneer building, and the Croydon station is several years earlier than, for instance, the station building at Munich, completed only last year. Here everything has been simplified and straightened out. The ground floor plan is based on a steel frame grid of uniform bays about 14 ft. square, with the exception only that in the larger rooms some stanchions are omitted to increase the spans to 28 or 42 ft. All partitions are of light, easily removed material, and the whole building is, therefore, capable of a maximum degree of easy alteration or expansion.

The field side is one continuous exit or entrance through glazed doors; traffic routes are all short and are kept well distinct from each other for the different types—passengers, freight, post, Customs, staff of all kinds. A really adequate restaurant commands an open view of the field. Both restaurant and central hall are simply and charmingly decorated rather by the use of colour and texture than by any added ornament. The scheme is of white plaster, silver lamp fittings and other metal work, golden-grey travertine, oak woodwork stained a greenish-brown and heavy linoleum patterned in the same greenish-brown and blue. The hall occupies two floors, and so gets splendid clerestory lighting. The outside, by careful grouping of windows, avoids the mechanical effect that might tend to arise from the uniform bays. The control tower at one end is balanced by the meteorological station at the other. The upper floors have further offices and pilots' bedrooms, etc.

The Floyd Bennett Airport of New York varies from Munich principally in a central arrangement of the control tower, with weather bureau beneath it. In its elevation, however, one feels that the architect has tried his best to make the building look as little like an airport as possible. The Alhambra aerodrome of the Western Air Express, near Los Angeles, is rather more like an airport, if less refined, but still seems to have lost its natural vigour of outline in meaningless breaks and odd-sized windows.

There is, of course, no reason why the station should be a symmetrical building. The fine station building at Schiphol, Amsterdam, is radically asymmetrical, the blocks at each side of the vigorously massed control tower being completely different in shape, height and planning. In elevational effect this building seems to me to achieve an admirable combination of modernism and picturesque gaiety, but the plan is, in fact, rather cramped and will prove difficult to alter and expand.

Nor is there any reason why the station should keep to a rectangular form; at Lyon is one planned to present the angle of its V-shape boldly out to the field. I do not think the plan has quite succeeded; too much has been

sacrificed to preconceived notions of the general V-shape and the 12-sided hall, which has a domed roof and not unnaturally a most inconvenient echo. There are too many awkward angles and waste spaces. The structure is—I think mistakenly—in reinforced concrete throughout, with an extensive basement of garages and stores approached by ramps at either end. The elevation is much more satisfactory—a really enterprising essay in the style of M. Corbusier.

I have so far treated hangars and stations as completely separate entities. It is not, however, essential that they should be so. Indeed, I do not think it generally desirable that stations and hangars should be combined or even built up against each other; their purposes are essentially different and each should have room to expand.

May I summarise some of the chief things I have tried to say about aerodrome design? The first of these, the necessity for the early selection and reservation of aerodrome sites. Second and paramount in design is the importance of securing safety for aircraft by, for instance, keeping all buildings as low as possible. Third is the need for speed and orderliness in all traffic communications, that is, for acute planning. Fourth, out of acute planning a sensitive architecture can produce fine and appropriate buildings without any added elaborations. Fifth, here is a field where uncertainty and unpredictability are the most universal factors; design and materials should be in the highest possible degree fluid and adaptable.

And what in all this aerodrome work of to-day and the future is the place of the architect? I would say that architects are, and should be, primarily planners, as opposed, for instance, to engineers who are primarily constructors. Aerodrome work is fundamentally a planning problem. It follows that architects and town planners should be at work on every aerodrome project from the start; and the more they can know about aviation, the better will they be able to help to fulfil the client's programmes that are presented to them. But the field is not one for the architect alone; it bristles with structural problems for the engineer, with costing problems and land problems for surveyors and with technical aeronautical problems for the specialised aerodrome consultant. The close co-operation of all these different skills will alone ensure a successful outcome.

After Mr. G. L. Pepler had moved a vote of thanks to the lecturer, many aviation experts joined in the discussion, offering a good deal of adverse criticism to Mr. Dower's views; these included Majors Mealing and Mayo, Capt. Winters, and Messrs. Handley Page, and Hall, and others. Mr. Dower is replying to these in the Journal of the R.I.B.A.

# Airport News

## CROYDON

**I**MPERIAL AIRWAYS' old veteran de Havilland 50, G-EBFP, has returned to Croydon, after being rebuilt following the crash some months ago. I wonder how much of the original machine is in this rebuilt version.

The late Lt. Com. Glen Kidston's Lockheed Vega paid us two visits this week for A.I.D. inspection. The pilot on each occasion was Mr. Cathcart Jones, who flew to the Cape, as second pilot, with Com. Glen Kidston. The machine seems to be as good as ever.

On Saturday the famous Corinthians Soccer team left for Paris by Imperial Airways, and returned on Monday morning by the 8.30 a.m. service.

Another wet week-end spoilt business for the joyriding firms. In spite of the weather, Imperial Airways had a large party of between 200 and 300 visitors on Saturday afternoon, and a large number of them took flights in one of the Handley Page 42's. The party were here in connection with the proposed new City of London Flying Club, whose object, I believe, is to stimulate interest in private flying. Rain fell the whole time the party were here, and the visibility was less than 1,000 yd.

One of the luckiest men alive to-day is a press photographer who was taking photographs of the proceedings. In his rush to get a good picture, he ignored the propeller guards, steps and staff warnings, and before he could be prevented he dashed round the guard into one of the airscrews of a Handley Page 42. Luckily for him he realised his madness at the last moment and ducked, but not quite quick enough, the propeller knocking his hat off, just cutting his scalp. He was given first-aid by the Air Ministry Medical Service and afterwards proceeded to hospital for a few stitches. In future he will no doubt treat airscrews with due respect. Had he been killed it would have been entirely his own fault, every precaution having been taken, but he ignored all warnings.

One of Imperial Airways' old W.10's left here during the week, piloted by Mr. Fielding, of Aviation Tours, Ltd., to join Sir Alan Cobham's circus, and also one of Rollason, Muir & Rickard's Desoutter machines. Sir Alan Cobham himself likewise paid us a visit this week.

Traffic figures for the week were:—Passengers, 887; freight, 32 tons.

P. B.

## FROM HESTON

**M**ONDAY, April 11.—Heston had the pleasure of welcoming back Mr. F. E. Clifford, of the Brigade of Guards Flying Club, who left the Airport last September in his "Puss Moth" G-ABFY. His ultimate destination was Cape Town, which he reached safely, taking advantage of the journey to visit places of interest on the way. He said that he had subsequently done 50 very enjoyable flying hours touring round the Union of South Africa. He sold his machine in South Africa and journeyed back by boat.

Lord Willoughby de Broke purchased a "Puss Moth" (G-ABNC) from Brian Lewis & Co.

We had an excellent example of "good service" to-day. One of our private owners had flown to the Continent and force landed about 30 miles south of Lyons with engine trouble. He telephoned from there to Heston about 7.30 p.m., and was assured a pilot would collect his machine at the earliest possible moment. Mr. E. H. Newman, on behalf of Henly's, Ltd., caught the 8 a.m. airline the following morning at Croydon for Lyons, and after completing the journey by one of the "noted" local French train services, had the machine in flying condition by 6 p.m. Mr. Newman flew the machine the following morning down to Nice, where he delivered it by noon.

**TUESDAY, April 12.**—Mr. Trafford, accompanied by his mother, cleared Customs and set off for Geneva in his "Moth" G-ABAM.

Sir Kenneth Crossley, Bart., who is a very enthusiastic cross-country flyer, arrived from Cheshire in his "Moth" G-AAKC, which was formerly the property of his daughter, Miss Fidelia Crossley. Miss Crossley is at present on her way back from India, where we hear she has been doing a considerable amount of flying.

The "Desoutter" of Personal Flying Services (G-ABFO), piloted by Mr. Ledlie, cleared Customs and proceeded to Antwerp with two passengers. This was a journey of a very urgent nature, and, although the two passengers arrived without any previous warning, they had cleared Customs and were off within a quarter of an hour of their arrival.

Count L. Schaesberg and Mr. Antoine Seilern arrived in their "Klemm" D.2096. On Wednesday they flew down to Hamble to the Air Training Service, where it is Mr. Seilern's intention to take a course later in the year.

**WEDNESDAY, April 13.**—This was the only really good flying day during the week-end, and pupils took full advantage of it, Airwork School of Flying being particularly busy.

The "Moth" (G-AAUS), of Texas Oil Co., cleared Customs and left for Ireland.

Flt. Lt. Heslop, on a "Fairey III," left Heston for Paris—in connection, it is understood, with the visit of Lord Londonderry to Geneva.

Capt. Ferguson proceeded to Sandwich, picked up a passenger, and flew him to Hatfield. This enabled the passenger in question to take part in a golf tournament and keep an important appointment that evening.

**THURSDAY, April 14.**—Mr. Tutt left in "Puss Moth" G-ABGS, which he had hired from Brian Lewis & Co., for a three weeks' tour of the Continent.

G-ABFO ("Desoutter"), of Personal Flying Service, Ltd., returned from Antwerp.

Capt. Crossley and Mr. Mitchell, in "Moth" EI-AAB, cleared Customs and proceeded to Ireland.

Flt. Lt. Lester, in "Moth" G-ABND, returned from Paris.

**FRIDAY, April 15.**—Mr. Meny, with one passenger, arrived in his "Puss Moth" G-AAXO from St. Ingelvert.

Mr. Loel Guinness left in his "Puss Moth" G-AAXR for Paris.

Count L. Schaesberg and Mr. Antoine Seilern left in "Klemm" D.2096 for St. Ingelvert and Paris, from whence they are returning to Berlin.

**SATURDAY, April 16.**—Flt. Lt. Ivins cleared Customs and left at 7.30 a.m. in his machine G-EBIO for Jersey.

Mr. Jackaman left in his "Puss Moth" G-AAYE for Paris, also Mr. Meny in his "Puss Moth" G-AAXO for the same destination.

**SUNDAY, April 17.**—Tail wheels in place of skids appear to be on the way to popularity. We observed Capt. Diamint, of Dominion Motor Spirit Co., testing G-ABMD, the company "Puss Moth," which has just been fitted, while Mr. Davenport has also had his "Puss Moth" G-AAZM so fitted.

An interesting experiment in blind flying was carried out by Capt. V. H. Baker and Mr. J. J. Parks, the latter of whom is the manager of the Service Department of Airwork, Ltd., Heston. Mr. Parks was under the hood and made a perfect landing solely by means of instructions given him by Capt. Baker down the telephone.

Miss Rosalind Norman, daughter of Sir Henry Norman, Bt., who is just reaching the solo stage of her instruction, is one of the keen pupils in blind flying.

The new floor to the lounge was only finished late last night and hurriedly equipped with the new furniture early this morning. Members were full of praise of the comfort of the lounge as now set out, and with the wintry type of weather to-day it was made full use of.



# Air Transport

## NEW TRANS-AFRICAN AIR FLEET FOR IMPERIAL AIRWAYS

### First Armstrong-Whitworth "Atalanta" Monoplane Nearly Ready

**I**MPERIAL AIRWAYS announce that finishing touches are now being made to the first of the £150,000 fleet of eight new 4-engined passenger monoplanes, which are being designed and built specially for operation on the 5,500-miles trans-African airline between Cairo and Cape Town.

It is expected that this first machine will be ready for preliminary trials within the next few weeks and that the entire fleet will be in service on the African airway towards the end of this year. They will be known as the *Atalanta* class, and will bear the following individual names:—*Atalanta*, *Andromeda*, *Artemis*, *Astraea*, *Amalthea*, *Arethusa*, *Athena*, *Aurora*.

This great new British air fleet is being constructed by Armstrong Whitworth Aircraft, Ltd., of Coventry. Each of the monoplanes will, when fully loaded, weigh nearly 8 tons, of which more than 2 tons will be available for the accommodation of crew, passengers, mails and goods. They will each have a span from wing tip to wing tip of 90 ft., while from nose to tail they will measure 71 ft. 6 in.

Driven by four Armstrong Siddeley double "Mongoose" engines, developing a total of 1,400 h.p., they will not only have ample power to ascend with full loads from the high-altitude aerodromes which exist on the African airway—which from Nairobi to the Cape are at altitudes of approximately 5,000 ft., or about a mile above sea level—but their reserve of power will be such that, even in tropical conditions, they will be able to continue in flight with only three engines in operation at any height up to 9,000 ft., that is to say, as much as 3,000 ft., or over half a mile, above the highest aerodrome. This high performance has not been required on the European or India air routes and has not hitherto been provided in any country in the world.

The maximum speed of these new monoplane airliners will be between 140 and 150 miles an hour, while they will cruise at a speed of approximately 120 miles an hour,

which will enable considerable acceleration to be effected in the time-tables of the sections between Cairo and Cape Town. It is hoped, in this regard, that the present total time schedule of 11 days between London and Cape Town will be reduced in due course to 9 days.

It being the aim in civil aircraft design to combine a high cruising speed with as low as possible a landing speed, it may be noted that these new monoplanes, although able to attain, when required, a top speed of about 150 miles an hour, will, at the same time, be able to alight at less than 55 miles an hour.

A feature of the new monoplanes and one designed to provide a maximum of comfort when flying under tropical conditions, is the large size of the saloons, and the amount of space provided for each passenger. Special armchair seats will be fitted of a type enabling the aerial travellers to recline at full length whenever they desire to do so.

A special system of ventilation is being installed in each machine by which air is drawn in through ducts in the nose of the monoplane and then distributed through the cabin. This will mean that passengers will find it cool, high up in the air, even when they are in flight over the hottest sections of the African route. Aerial travel in these new machines will, in fact, be the most comfortable, as well as by far the most rapid, form of travel in Africa, more especially as the four engines will all be mounted out on the wings, well away from the body of the machine, thus ensuring a maximum of quietness in the passenger saloons, the walls of which will also be insulated with sound-deadening materials.

These eight new British airliners, which are of lightweight strip-steel construction, adopted specially for aircraft use, represent, together with the necessary spare parts, a total cost of £150,000, and have been designed specially to meet the conditions, geographical and climatic, of the trans-African route which stretches for 5,500 miles from Cairo to Cape Town.

### "Graf Zeppelin" Still Going Strong

THE German airship *Graf Zeppelin*, which left Pernambuco on April 9 on the return of her second round trip this year, duly arrived back at Friedrichshafen on April 13, having encountered heavy head winds *en route*. The third of the series of flights—and the sixteenth voyage across the Atlantic—started on April 17, when the airship left Friedrichshafen with, we believe, Sqd. Ldr. Booth—who is visiting the Zeppelin works—as one of the passengers.

### By Air to the Isle of Wight

PREVIOUSLY known as Wight Aviation, Ltd., Portsmouth, Southsea & Isle of Wight Aviation, Ltd., now have their head office at the municipal airport, Portsmouth, with their registered office Regent Street, Shanklin (Telephone Shanklin 76). This firm has now acquired the first metal "Wessex" (three 7-cyl. Armstrong Siddeley Genets), which accommodates eight passengers in the cabin. This machine will operate between the island and Portsmouth, as well as a week-end service direct to London. The fare between Portsmouth and Ryde will be 6s. single and 10s. return. The Ryde aerodrome is not yet usable for the "Wessex," but Mr. Hunter, of Chester, is rapidly making it so. The fare from London to Ryde will be about £2 single, while from Shanklin to Portsmouth it will be 15s. single and 27s. 6d. return.

### Air Mails to Persia—and Elsewhere

THE Postmaster-General announces that the air services from Baghdad to Tehran and from Baghdad to Shiraz, Isfahan and Tehran have been suspended. Air mail correspondence for Persia will continue to be conveyed by the England-India air mail service as far as Baghdad, Basra, Bushire, Lingeh, Jask or Karachi, the journey to

other places in Persia being completed by the ordinary route. It is also announced that, as from April 18, the latest time of posting air mail correspondence in the air mail letter box outside the General Post Office, London, for France, Italy and Switzerland will be 6.45 a.m. instead of 6.0 a.m., and for Belgium, Czechoslovakia, Danzig, Denmark, Estonia, Finland, Germany, Holland, Latvia, Lithuania, Norway, Poland, Russia and Sweden 7.45 a.m. instead of 6.45 a.m. The night air mail service to Cologne, Hanover and Berlin will leave an hour later than at present and the latest time of posting in the air mail letter box outside the General Post Office, London, will be 8.0 p.m. instead of 7.0 p.m.

### Tea Flights over London

IMPERIAL AIRWAYS, on April 17, resumed their Summer Season Tea Flights over London. On each Friday and Sunday one of the 4-engined Handley Page airliners will leave Croydon at 3.45 p.m., and during the flight over London tea will be served. The cost of these trips, including motor-car transport to and from the Airway Terminus at Victoria, is now only £1 10s. per passenger.

### Halifax-St. John's Air Service

PAN-AMERICAN AIRWAYS are reported to be planning a weekly air service between Halifax, N.S., and St. John's, Newfoundland, to start this summer. Twin-engined seaplanes, carrying 20 passengers, would be used, and the journey would occupy 5 hr.

### London-Rotterdam at 184 m.p.h.

HELPED by a following wind, one of the K.L.M. airliners flew on April 7 from London to Rotterdam, a distance of 230 miles, in 75 min., or at a speed of 184 m.p.h.



# Private Flying and Gliding

## AT BROOKLANDS

Wind and rain have greatly deterred flying at Brooklands this week. Several new members, however, have joined up, including Mr. McLaren, and in spite of the weather, Mr. Murray Phillipson successfully completed his blind-flying course, finishing his test circuit directly over the aerodrome. An innovation which it is felt will greatly assist busy pupils, is early-morning flying, and this can be arranged provided notification is given to the school before 6 p.m. on the previous day.

The Brooklands Aero Club has organised a dance for April 23. This will be the first official function in the new club and the applications for tickets already received suggest that the success of the event is assured.

Amongst the attractions already arranged for the Civil Air Display on May 28 is a concours d'Elégance, for which *The Tatler* is presenting a trophy for the best kept cabin machine. This contest, which will be judged by members of the A.I.D. (after taking into account the number of hours each machine has been flown), is open to all private owners. Other prizes, particulars of which will be published later, are offered for open machines. The Pylon racing will probably be confined to three aircraft, but this should prove a great attraction, as this form of racing has not been seen since the old "Hendon" days.

## AT READING

The sleeping accommodation provided at the clubhouse of the Reading Aero Club has proved a great attraction, and for some considerable time past this has been completely full. Pupils from all over the world are now congregating at Reading, and those at present learning to fly include natives of Greece, China, Holland, America and Australia. Dealing in second-hand aircraft is going ahead steadily, two aircraft being sold last week to the Scottish Eastern Aircraft Services at Earlston and one to Mr. W. R. Westhead. Arrangements have now been completed whereby night-flying instruction will be given at Woodley and from the end of next week onward this form of instruction will be a regular event. Those interested should apply early to the school secretary, as the number of applications already received would appear to indicate that the instructors may have their hands full. The rates are being kept especially low and two machines have been provided for the purpose, one of which is fitted with a Reid & Sigrist Turn Indicator and the other with a P.B. Deviator. The repair shop has a large amount of work on hand, and quite a considerable number of machines have recently passed through for their annual C. of A. A further attraction at this aerodrome is the range of reasonably priced lock-ups for private owners' machines, the demand for which is increasing in a most satisfying manner.

## THE CINQUE PORTS FLYING CLUB

A dinner-dance is being organised by the Cinque Ports Flying Club on April 29 at 7.30 p.m. The following afternoon there will be a small air meeting and an At Home to which many manufacturers have promised to send demonstration models. On the Sunday, May 1, a motor treasure hunt has been arranged. People interested in any of these events should apply for further particulars to the Cinque Ports Flying Club, Lympne Airport, Kent.

One of the most recent additions to the club's fleet is a "Moth" fitted out for night flying, and, as was recently announced, the Brooklands School of Flying will collaborate with the Cinque Ports Club, as far as possible, by sending most of their pupils for this form of flying to Lympne. Weather the last few days has been very unfavourable, and this has naturally reacted in a detrimental manner on the amount of flying done, but such is the keenness of the private owners of the club that almost all of them have spent some time in the air during the week.

## THE MESSENGER BOYS' FLYING CLUB

Under the chairmanship of Mr. H. F. Russell, General Manager of the Commercial Cable Co., Wing Com. Orlebar

gave the Messenger Boys' Flying Club a most interesting and instructive talk on high-speed flying at the offices of the company in Wormwood Street, E.C.2. Wing Com. Orlebar, who was accompanied by Mrs. Orlebar, described in detail the various phases through which the Schneider Trophy contests have gone since the first race in 1913 down to the last contest in 1931.

His lecture was illustrated throughout with a series of slides which showed many of the different machines. The occasion was also one of some note for the club, as Mr. H. F. Russell presented Messenger R. R. McDonald with a small replica of a "Moth" to commemorate the latter's recent achievement of being the first messenger boy to fly solo. McDonald has been taught by Surrey Flying Services at Croydon, and is already well on the way to obtaining his "A" licence.

Mr. A. W. Sunderland proposed a vote of thanks to Wing Com. Orlebar for giving the lecture, and Mr. Geoffrey Dorman, who is the moving spirit of, and was mainly responsible for starting, the messenger boys' club, also in a few words gave a little of the history of the club. By way of demonstration of the efficiency of the Commercial Cable Co., a cable was sent to Mr. Clarence H. Mackay, the President, in America, and a reply was received expressing his appreciation to Wing Com. Orlebar for giving the lecture, all in less than one minute.

## SOUTHDOWN GLIDING CLUB

The inaugural Ball of the Southdown Gliding Club was held in the Grand Hotel, Brighton, on Saturday, April 16. Mr. E. Gordon England, the chairman of the B.G.A., spoke on the future of aviation, and paid tribute to the enthusiasm of the younger generation who have been responsible for the revival of gliding interest. He asked for support for the Southdown Gliding Club, particularly as the district possesses what was probably the premier site for gliding in the country.

This club is the amalgamation of two former clubs, the Southern Counties Soaring Club and the Southdown Sky-sailing Club, which has been achieved in order that greater advantages may be shared by all members. The Mayor and Mayoress of Brighton, Alderman T. J. Braybon and Mrs. Braybon, received the guests, and among whom were the Mayor and Mayoress of Hove, Mr. and Mrs. R. F. Dangnall, and Mr. A. York Bramble, who is the general secretary of the new club.

## LONDON GLIDING CLUB

Little flying could be done during the week ending April 10, as although the wind swung round to the S.W. (which is the right direction for gliding on this site), it was far too rough until some time after sunset. Notwithstanding this, however, several enthusiastic members immediately got the "Dagling" out, and were able to make six short flights before it was really too dark. The whole of Sunday morning was similarly far too gusty, but after lunch both the "Prüfling" and the "Dagling" were flown repeatedly from a low ridge near the foot of the downs, but towards teatime conditions again became too bad, causing members to return the machines to the hangars until dusk, when once more short flights were possible. The amount of work put in is shown by the fact that some 16 people received on an average four flights each, and in spite of the gusty weather both machines were intact at the end of the day. The "Dagling" this time was tried by the launching team dispensing with the preliminary walk. By this means it was found that the glider rose immediately with a far less expense of energy on the part of the team. Being thoroughly optimistic as regards weather conditions, a Whitsun camp is being organised on the same lines as that which was held at Easter, and in order that it may be kept within limits so that every member shall have a chance of flying, early application is advised to the Sec., 35, Milk Street, London, E.C.2, who will supply all the information concerning tents and living accommodation available on the site.

# Airisms from the Four Winds

## Mr. C. W. A. Scott Off Again

AT dawn on April 19 Mr. C. W. A. Scott left Lympne on an attempt to recapture his record for the flight to Australia which was beaten last year by Mr. C. A. Butler in a Comper "Swift." Mr. Scott was flying the same "Gipsy Moth" he used on his previous record flight. He reached Brindisi at 6 p.m. the same evening, and left for Aleppo immediately after refuelling.

## To the Cape by Autogiro

MR. J. N. YOUNG, the first private owner of an Autogiro—a C.19 Mark IV 2-seater, with 100-h.p. Armstrong-Siddeley "Genet"—hopes to leave Hanworth to-day (April 22) on a flight by easy stages to the Cape. His route will be via Catania, Tunis, Cairo, and thence along the regular Cairo-Cape route. Mr. Roy Tucket, who attempted an England-Cape flight in 1929 is also on his way to England from the Cape with the object of making a similar flight, also in an Autogiro.

## A French Attempt on the Cape Record

MM. GOULETTE and SALEL, the French pilots who established a record for a flight to Madagascar and back last year, left Le Bourget at 5.25 a.m. on April 13 for Cape Town in an attempt to lower the record recently set up by Mr. Mollison. They are flying a Farman 190 (300-h.p. Lorraine) and are taking the route via the West Coast.

## Finis

CAPT. BREMER, the Finnish airman who left Helsingfors on March 19 on a flight to Capetown, via Germany, Italy, and Egypt, in a Junkers Junior, arrived at the Cape on or about April 15.

## Prince Ghica Home Again

PRINCE GHICA, of Roumania, who, as previously reported in FLIGHT, set out from Bucharest on March 30 in a S.E.T.61 biplane to fly to Saigon, Indo China, and back, has accomplished the double journey. At the moment details of the flight are not available, but we understand that he reached Saigon on April 7 and started on the return flight on April 10 and reached Bucharest on April 16.

## Furlough Flight Finished

MAJ. WILLIAM JONES, pilot instructor to the Karachi Aero Club, who left Karachi in a "Puss Moth" on April 5 for England, arrived at Littlestone, Kent, on April 15. He has flown home on leave, and was accompanied by an Indian pupil.

## Mr. J. A. Mollison Home

MR. J. A. MOLLISON, who recently accomplished a record flight from England to the Cape, landed at Southampton from the *Carnarvon Castle* on April 18. He was received by the Mayor of Southampton, and later flew with Sir Alan Cobham to Basingstoke to attend the air display there.

## A French Semi-Official Flight to Africa

M. PHILIPPE D'ESTAILLEUR-CHANTERAINE, president of the committee of L'Entente Française, who last July carried out a flight round Africa, has just started upon another mission. Piloted by M. Freton, with M. Mistrot as engineer, he left Le Bourget on April 16 in a Farman 190, this time with the object of flying to Jibuti (French Somaliland) and thence across Africa to Dakar. His route will be as follows:—Istres, Tunis, Tripoli, Benghazi, Cairo, Aswan, Atbara, Massaua, Jibuti, Massaua, El Fasher, Abeshir, Ft. Lamy, Kano, Niamey, Ouagadougou, Bamaka, Dakar. He will then proceed via the Aéropostalé route along the west coast to Oran. Shell fuel is being used on this flight.

## "I Must Go Up In The Air Again"

CROSS-COUNTRY flying is in the blood just now, it appears, for, apart from those now in progress and already foreshadowed in FLIGHT, several new ventures are reported. Mr. Yoshihara, the Japanese pilot who, in 1930, flew from Berlin to Tokio in a Junkers "Junior," is reported to be preparing for a flight round the world in a Saro "Cutty Sark" amphibian. Mr. R. F. Hall, of the Lancashire Aero Club, hopes to set out on a flight from Manchester to Cairo next month. An ambitious plan comes from Mr.

J. D. M. Gray, of Toronto, who proposes to fly a Comper "Swift" from Novar in the north of Scotland to New York via the Faroes, Iceland, Greenland, Baffin's Land, and Canada, a distance of 4,065 miles. He is fitting both wheels and skis to his machine. M. Alfons Breitenbach, a Swiss pilot, is planning a flight to Sydney in a Salmson-engined Klemm monoplane. Capt. Jimenez, the Spanish pilot who flew across the Atlantic in 1929, is arranging a world tour in a "Puss Moth." He hopes to leave Spain next August and fly through Europe and Russia to Japan, China, Manila, Borneo, Java, Australia, Straits Settlements, Burma, India, Persia, Iraq, Egypt, Cape Town, up through Portuguese West Africa to Belgian Congo, Nigeria, French Sudan, the Sahara, Morocco, and back to Madrid. Some tour! Floats will be fitted over certain portions of the route. Finally, also in August, Mario de Bernardi, the Italian Schneider pilot, hopes to make a non-stop flight from Rome to China.

## Antarctic Exploration by Air

TWO American expeditions to explore the Antarctic continent with the help of aircraft are now being planned. Rear Admiral Byrd is preparing one expedition for this year, and is said to have secured financial backing. He plans to leave New York in September, which, of course, is spring in the Southern Hemisphere. Mr. Lincoln Ellsworth is preparing for an aeroplane exploration in the following Antarctic summer. It will be remembered that he was the companion and financial backer of Amundsen in the successful flight of the airship *Norge* across the North Polar ocean and also in the attempt to reach the North Pole in two Dornier "Wal" flying boats. For his expedition next year he has secured the services of Bernt Balchen, who is an old companion of Admiral Byrd. Balchen was one of the pilots of the Fokker in which Byrd flew the Atlantic in 1927, and a couple of years ago he flew Byrd over the South Pole. In his book, "The Flying Dutchman," Mr. Fokker rates Balchen as the second best long-distance pilot in the world, giving first place to Kingsford Smith. Ellsworth proposes to establish a base at Framheim, on the Bay of Whales, which lies on the western shore of the Ross Sea to the south of New Zealand. Thence he proposes to fly eastward over the unexplored Ross Quadrant to Weddell Sea, which lies to the south of the American continent. To avoid confusion, we may explain that when facing the South Pole, eastward implies a left-hand turn. The land will be photographed along the route, and it is hoped to ascertain whether the Queen Maud range south of Ross Sea connects with the mountains of Graham Land opposite Cape Horn, or whether the two great bays of Ross Sea and Weddell Sea unite and cut the continent in two. The flight there and back will cover some 3,000 miles.

## Another Arctic Airship Expedition

GENERAL NOBILE, the Italian airship designer, has interested the Russian Government in his plans and is building an airship near Moscow. The Soviet Government is to finance a flight into the Arctic by Gen. Nobile in this airship, which is to explore the tract east of Novaya Zembla. Search will also be made for traces of the six men of the crew of the airship *Italia* who were carried away when the gondola was broken off. Nobile has gone to Italy to raise a party of Italian engineers. The Soviet Government is keenly interested in Arctic exploration, and is spending more than any other country on the "Second Polar Year."

## The Disarmament Conference

SIGNOR GRANDI, the Italian Foreign Minister, submitted proposals to the Disarmament Conference at Geneva on Wednesday, April 13. His proposals aimed at breaking down aggressive armaments as a whole. It would be useless, he said, to abolish heavy artillery and permit bombing aeroplanes. The abolition of aircraft carriers was necessarily connected with the abolition of bombing aeroplanes. Sir John Simon left Geneva for London the same day, flying from Paris to Croydon to attend the dinner to Mr. Mellon, the American Ambassador. He returned to Geneva on the Friday, again using the aeroplane as far as Paris.



365

King's Cup Air Race

COMPETITORS who have already entered for the King's Cup Race are reminded that complete entry forms must be received by the Royal Aero Club not later than 5 p.m. on May 1, 1932. The Siddeley Trophy (presented by Mr. J. D. Siddeley) will be awarded to the Club whose representative is highest in the placings for the King's Cup. The aircraft must be the *bona fide* property of the pilot representing the Club. Clubs must nominate their representatives to the Royal Aero Club not later than May 18. The attention of competitors is drawn to a slight alteration in the course of the King's Cup Air Race, which will be flown on July 8-9. In Section 1 it has been decided not to use Lympne Aerodrome and to substitute turning points at Abingdon (R.A.F. station) and Shoreham. The course, of approximately 1,223 miles, is therefore as follows:—Section 1, July 8.—Brooklands, Abingdon, Shoreham, Portsmouth, Bristol (Control), Birmingham, Hooton, Woodford, Leicester (Control), Ipswich, Northampton, Brooklands. Section 2, July 9.—Brooklands, Bristol, Northampton, Brooklands (Control), Shoreham, Portsmouth, Bristol, Brooklands.

Aero Engine Accessories

THE extremely interesting paper under above title, read by Mr. W. L. Taylor before the Royal Aeronautical Society on April 14, was not, unfortunately, of a character which enabled it to be usefully summarised. As we are unable to spare the space to publish the paper in full, we can only recommend such of our readers as are interested in the subject to await the publication of the paper in a forthcoming issue of the Society's journal. The paper dealt with the following subjects: Superchargers, automatic boost control, automatic mixture control, flame traps, magnetos, automatic ignition control, sparking plugs, starters (gas starting, inertia starters, cartridge starters), silencers, and flexible airscrew hubs.

National Aviation Day Campaign

BELOW is a list of the places at which Sir Alan Cobham will be holding his National Aviation Day, during the following week:—

April 25, Leighton Buzzard, The Flying Ground, Billingdon Road; April 26, Banbury, The Flying Ground, Warwick Road; April 27, Kidderminster, Hoo Farm, Worcester Road; April 28, Worcester, Perdiswell Park, Bilford Road; April 29, Abingdon, Black Horse Barn, Faringdon Road; April 30 and May 1, Edgware and Hendon, Stag Lane Aerodrome.

Mr. H. G. Watkins Honoured

H.M. THE KING has approved of the award of the Founder's Medal of the Royal Geographical Society to Mr. H. G. Watkins for his work in the Arctic regions, especially as leader of the British Arctic Air Route Expedition.

A Television Talk on Aircraft

ON April 27, at 11.30 a.m., Mr. B. R. Clarke will broadcast a Television talk from the Baird Television Studios, Long Acre, on Aircraft, which will be "illustrated" by models of the various aircraft mentioned. These will include the following:—Bleriot XI; D.H. "Moth"; Blackburn "Bluebird"; Avian Sports; Desoutter; Gloucester Fighter; Supermarine S6B; Handley Page 42 glider; and Short "Kent" flying boat.

Aerodromes

AN exhibition of photographs and drawings of aerodromes, illustrating their architectural and town-planning design, is being held in the R.I.B.A. Galleries, 9, Conduit Street, until April 30, from 10 a.m. to 8 p.m. (Saturdays 10 a.m. to 5 p.m.), admission free. This exhibition, which has been formed by the Aerodromes Committee of the R.I.B.A., illustrates the ground work which has been, and is being, done in many countries with regard to the establishment of aerodromes.

Airscrew Company Annual Dinner

THE directors and staff of the Airscrew Company put aside business for a few hours when they met together socially on the occasion of their annual dinner, which was held at the Wey Restaurant, Weybridge, on April 15. The party, numbering about 40, spent a very enjoyable evening under the chairmanship of the managing director, Mr. J. D. Titler. The occasion also marked the introduction of Dr. Watts, who has recently joined the board as technical director, and in proposing the toast to him Mr. Titler remarked that the prestige and growth of the company would be enhanced by the addition of so eminent an authority on technical problems. In reply Dr. Watts said it was his ambition to win that same loyalty and respect which Mr. Titler had so evidently deserved and won.

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1930 being given in FLIGHT, January 16, 1931.

	Imports.		Exports.		Re-exports.	
	1931.	1932.	1931.	1932.	1931.	1932.
	£	£	£	£	£	£
Jan. ...	7,965	2,456	142,596	122,942	1,074	863
Feb. ...	3,303	2,503	110,587	181,482	1,293	90
Mar. ...	5,615	1,946	83,088	167,195	3,441	200
	16,883	6,905	336,271	471,619	5,808	1,153

PUBLICATIONS RECEIVED

*Motor Racing.* By S. C. H. Davis. London: Iliffe & Sons, Ltd. Price 7s. 6d. net.

*Gliding and Motorless Flight.* By L. Howard-Flanders and C. F. Carr. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d. net.

*Almanacco Aeronautico, 1932.* Val. Bompiani, Milan. Price L. 12.

*Fléau Aérien.* By S. de Stackelberg. Réunies S.A., 23, Avenue de la Gare, Lausanne. Price Fr. 6-50.

*U.S. Advisory Committee for Aeronautics Reports: No. 378. Comparison of Full-Scale Propellers having R.A.F.-6 and Clark Y Airfoil Sections.* By H. B. Freeman. Price 10 cents. No. 379. *Rolling Moments due to Rolling and Yaw for Four-Wing Models in Rotation.* By M. Knight and C. J. Wenzinger. Price 15 cents. No. 401. *Combustion in a High-Speed Compression-Ignition Engine.* By A. M. Rothrock. Price 15 cents. No. 402. *Effect of Orifice Length-Diameter Ratio on Fuel Sprays for Compression-Ignition Engines.* By A. G. Gellales. Price 15 cents. No. 403. *Ice Prevention on Aircraft by means of Engine Exhaust Heat and a Technical Study of Heat Transmission from a Clark Y Airfoil.* By T. Theodorsen and W. C. Clay. Price 20 cents. No. 404. *The Effect of Increased Carburettor Pressure on Engine Performance at Several Compression Ratios.* By O. W. Schey and V. G. Rollin. Price 10 cents. Superintendent of Documents, Washington, D.C., U.S.A.

*Technical Notes of the U.S. National Advisory Committee for Aeronautics: No. 404. Tests of N.A.C.A. Airfoils in the Variable-Density Wind Tunnel, Series 24.* By E. N. Jacobs and K. E. Ward. January, 1932. No. 405. *Valve Timing of Engines having Intake Pressures Higher than Exhaust.* By E. S. Taylor. Feb., 1932. No. 407. *Effect of the Reservoir Volume on the Discharge Pressures in the Injection System of the N.A.C.A. Spray Photography Equipment.* By A. M. Rothrock and D. W. Lee. Feb., 1932. No. 408. *Preliminary Tests on the Vaporisation of Fuel Sprays.* By A. M. Rothrock. Feb., 1932. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

(Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1930

Published April 21, 1932

38,281. ECLIPSE AVIATION CORPN. Engine starting apparatus. (369,563.)

APPLIED FOR IN 1931

Published April 21, 1932

1,752. D. H. RIGHTON. Aeroplanes. (369,697.)  
9,999. H. J. STIEGER. Wings. (369,756.)  
13,080. BLACKBURN AEROPLANE AND MOTOR CO., LTD., and J. D. RENNIE. Method of transporting wings. (369,777.)  
14,570. F. B. DEHN. (SOARING PLANE CORPORATION.) Wings. (369,788.)  
15,190. R. TILING. Rockets for driving aircraft and model aircraft. (369,797.)  
18,673. E. G. BUDD MANUFACTURING CO. Trusses for use in aircraft structures. (369,820.)  
28,397. AVIONS H. M. D. FARMAN. Lubrication of i.c. engines. (369,875.)  
29,891. H. JUNKERS. Apparatus for measuring or gauging rough blanks. (369,878.)

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